306.8
Am3

Devoted to
TEXTILE
CHEMISTRY
BLEACHING
DYEING
PRINTING
FINISHING

AUGUST 4, 1941
VOLUME 30, No. 16

AMERICAN DYESTUFF REPORTER

OFFICIAL PUBLICATION
of the
PROCEEDINGS
AMERICAN ASSOCIATION
OF TEXTILE CHEMISTS
AND COLORISTS

Just try it!

Setacyl Direct Blue G D

Geigy suggests that you try Setacyl Direct Blue G D when confronted with the problem of "gas-fading" of Blues on acetates.

For a good percentage of acetate fabrics and shades, requiring the blue element, Setacyl Direct Blue G D should serve admirably, if tests and practical results are not to be denied.

Geigy technicians will be happy to give you suggestions how and where Setacyl Direct Blue G D fits into your production.

GEIGY COMPANY INC.

89-91 BARCLAY STREET — NEW YORK—NEW YORK

Sole Selling Agents in
United States and Canada
for J. R. Geigy, S.A.
Basle, Switzerland

In Great Britain
The Geigy Colour Co., Ltd.
National Buildings
Parsonage, Manchester

DYESTUFF MAKERS GEIGY SINCE 1758
EST. 1764

Boston · Providence · Toronto · Cincinnati · Philadelphia · Charlotte · Portland, Ore.

To Soften Water Effectively Without Precipitation Use -

QUADRAFOS*

(SODIUM TETRA PHOSPHATE—$Na_6 P_4 O_{13}$)

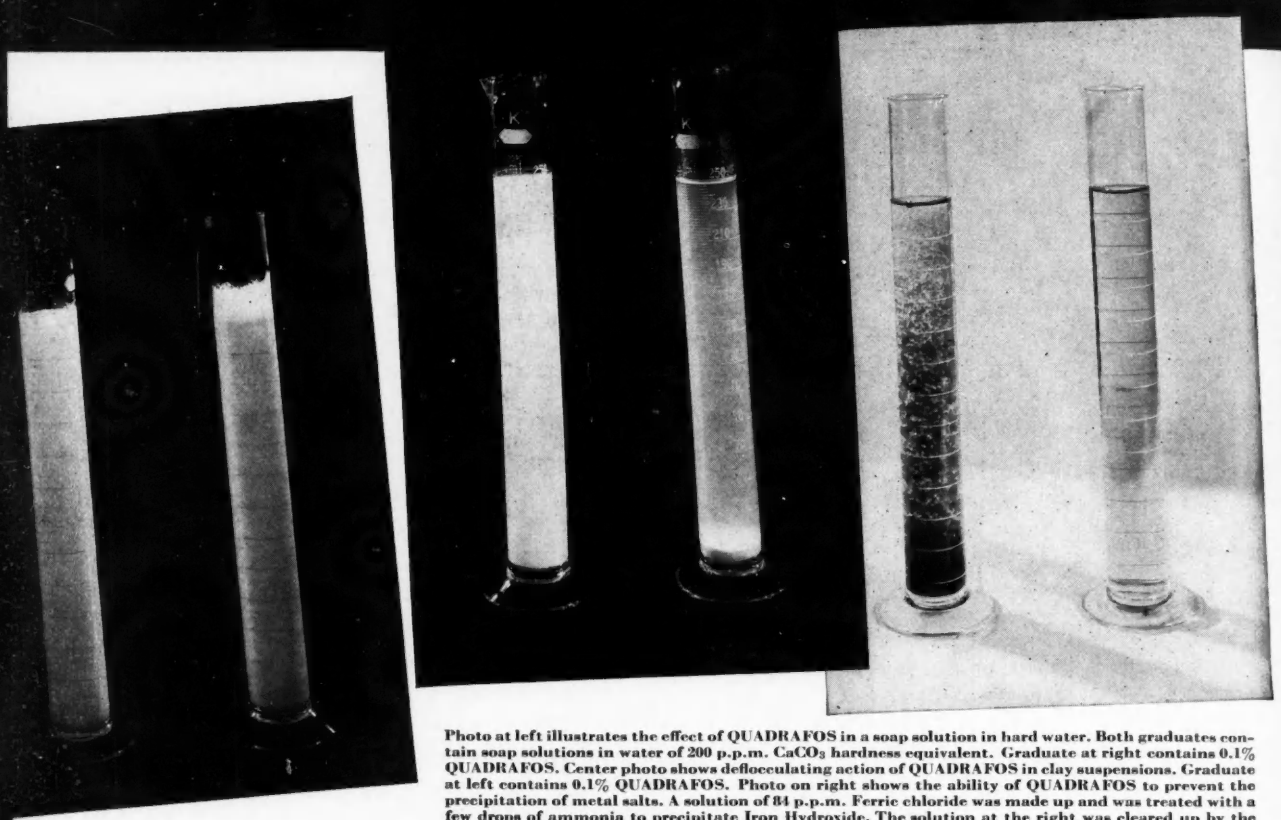
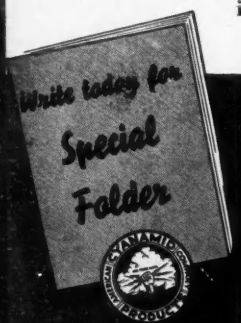


Photo at left illustrates the effect of QUADRAFOS in a soap solution in hard water. Both graduates contain soap solutions in water of 200 p.p.m. $CaCO_3$ hardness equivalent. Graduate at right contains 0.1% QUADRAFOS. Center photo shows deflocculating action of QUADRAFOS in clay suspensions. Graduate at left contains 0.1% QUADRAFOS. Photo on right shows the ability of QUADRAFOS to prevent the precipitation of metal salts. A solution of 84 p.p.m. Ferric chloride was made up and was treated with a few drops of ammonia to precipitate Iron Hydroxide. The solution at the right was cleared up by the addition of 0.5% QUADRAFOS.

QUADRAFOS is a carefully balanced anhydrous polyphosphate. It is rapidly increasing in industrial use because of its ability to soften water effectively without precipitation.

Besides preventing the precipitation of calcium and magnesium compounds QUADRAFOS is remarkably effective in holding the ions of many other elements in solution. Iron that contributes to operation difficulties when introduced with natural waters or as an impurity in other chemical raw materials may be sequestered and rendered inactive with QUADRAFOS. It also sequesters and renders inactive nickel chromium, lead and many other metallic ions.

A booklet on the advantages and uses of QUADRAFOS is available on request. Write for your copy and it will be sent to you promptly, without obligation.



AMERICAN DYESTUFF REPORTER

A. P. HOWES
Publisher

LOUIS A. OLNEY
Directing Editor

NORMAN A. JOHNSON
Managing Editor

MYRON D. REESER
Advertising Manager

Official Publication of the Proceedings of the American Association of Textile Chemists and Colorists

AUGUST 4, 1941

VOLUME 30 NUMBER 16

American Dyestuff Reporter, Vol. 30, No. 16, Aug. 4, 1941. Published every other Monday. Copyright, 1941, by Howes Publishing Co., 440 4th Ave., New York, N. Y. Domestic subscription, $5.00, Canadian, $6.00, Foreign, $6.00. Entered as second-class matter, Nov. 6, 1919, at the New York, N. Y., Post Office, under the act of March 3, 1879.

Contents

Contents of previous issues can be found by consulting the Industrial Arts Index at your library

• Special Articles

Fats and Waxes in Disguise—Concluded..... 399
W. C. Hunter-Turner

• Departments

Trade Notes—New Products..... 421
Technical Notes from Foreign Sources..... 423

• Proceedings of the American Association of Textile Chemists and Colorists

Calendar of Coming Events..... P401

Heat Transmission Through Textile Fabrics..... P402
Edward R. Schwarz

Meeting, R. I. Sectional Committee.....P405

National Defense P406
S. W. Cramer, Jr.

The Use of Fiberglas in Textiles..... P412
Paul W. Booher and Edward Ames

Why Resin Finishes Are Growing in Importance..... P417
Alden D. Nute

Meeting, New York Section..... P420

Copyright, 1941, Howes Publishing Co., Inc.

number 1 job of this great plant

Our primary motive is—and always has been—to furnish Calco customers with the finest dyes and the most practical, helpful service we know how to provide.

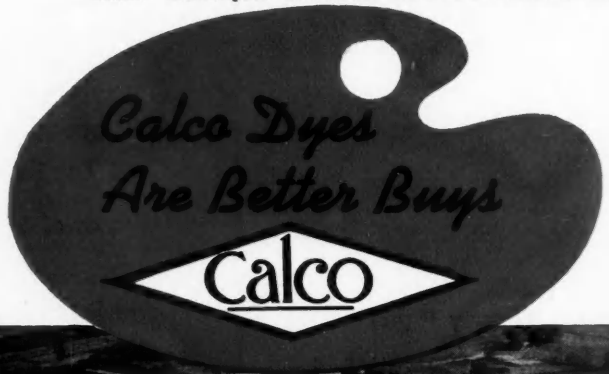
We intend to continue doing just that. At the same time, our obligations to America—just like yours—must come first right now. Among other things, this means doing our full share in supplying intermediates to meet the nation's vast requirements for defense. This we are especially well equipped to do. Because, of necessity, more than three-fourths of our entire plant is already devoted to the production of intermediates—without which there would be no Calco dyes.

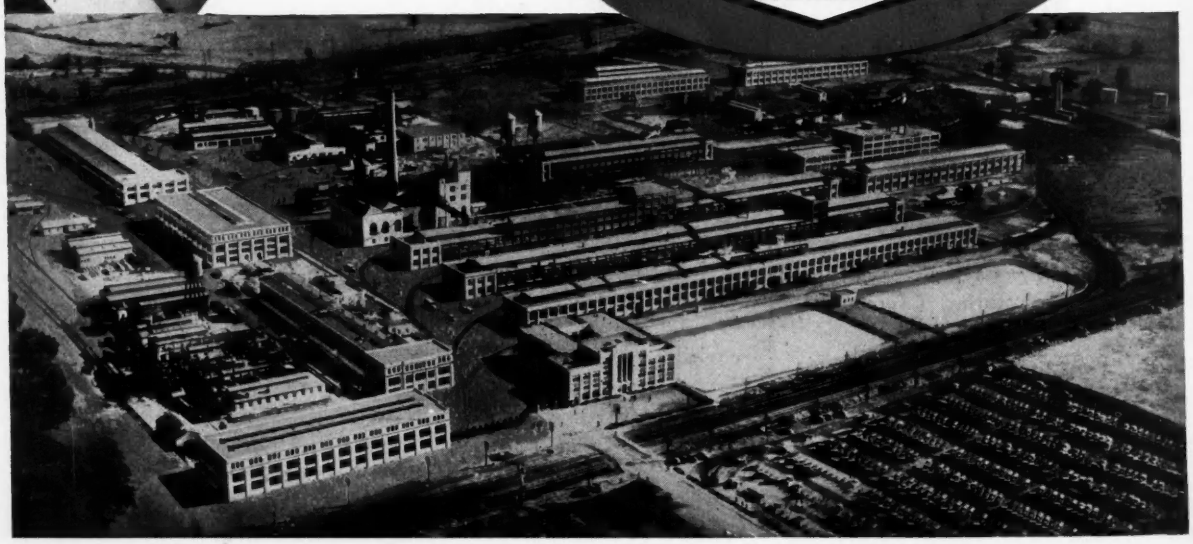
Defense comes first, of course. But, with your help we can do a whole lot better job of making our intermediate capacity cover your needs for dyes as well.

Please keep your orders in line with your actual current requirements. That will help us—and everyone else concerned—to give National Defense the right-of-way—and still meet your requirements for dyes as you really need them.

CALCO CHEMICAL DIVISION
AMERICAN CYANAMID COMPANY
Bound Brook, New Jersey

Boston · Philadelphia · Providence · New York · Charlotte · Chicago





AMERICAN
DYESTUFF REPORTER

VOLUME 30 AUGUST 4, 1941 NUMBER 16

FATS AND WAXES IN DISGUISE

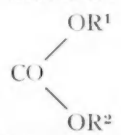
for Application to Textiles

An Account of Some Special Auxiliaries for Making Textile Materials Soft and Water Repellent, and for Increasing the Fastness of Dyes

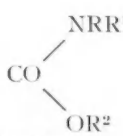
W. C. HUNTER-TURNER
Manchester, England

(Concluded from issue of July 21, 1941)

The second class of water repellent auxiliaries are organic carbonates or urethanes which may be applied to the textile material from aqueous liquors in which they are emulsified. These auxiliaries have the following typical chemical structures:



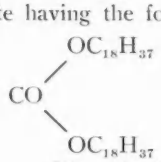
Carbonate



Urethane

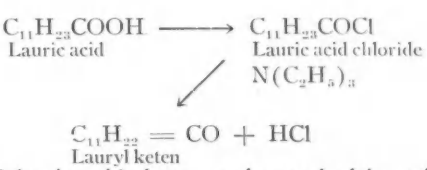
R, R^1, and R^2 represent hydrogen or aliphatic residue of high molecular weight. Such substances are readily obtained by reaction of the chlorocarbonic acid ester with the appropriate alcohol or amine, and especially good water repellent effects are produced when these substances contain at least one aliphatic radical corresponding to the fatty acids which are present in natural fats and waxes. Hexyl-ethyl-octadecyl-ethyl-, and cetyl-ethyl- carbonates, and di-octadecyl- and octadecylhydroxy-ethyl-urethanes may be mentioned as satisfactory products of this type.

Thus, if cotton fabric is treated for about 15 minutes in a bath at 40° C. containing 5 grams (per liter) of dioctadecyl carbonate having the formula:



Di-octadecyl carbonate

and emulsified with the aid of 5 grams of benzine and 6 grams of triethanolamine stearate or other soap, and is then mangled, dried, and heated for one hour at 90° C. it becomes permanently water-repellent. Alternatively, the fabric may be impregnated with a 1 per cent solution of the same auxiliary in carbon tetrachloride and this solvent evaporated off before heating, but in general most finishers would prefer to use the aqueous emulsion method.

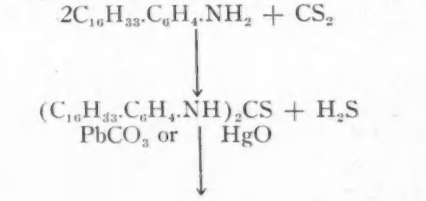


Instead of lauric acid there can be used oleic, palmitic, caproic, and similar fatty acids to make the corresponding ketens, all having water repellent properties. In using these to treat cotton, wool, and rayon materials it is simply necessary to impregnate the material with a solution of the keten in an organic solvent, evaporate off the solvent, and then heat the material at 110° C. The water repellency thus obtained is fast to washing and dry cleaning.

Just one more type of water repellent auxiliary may now be mentioned; it is related to the aliphatic esters of isocyanates and isothiocyanates previously described. These are mono- and di-substituted carbodiimides which have in their molecule at least one high molecular weight aliphatic residue, for example, cetyl or octadecyl groups. It is believed that auxiliaries of this type actually combine chemically with the textile material to which they are applied and it has been stated that they give softness as well as water repellency. The basic structure of these carbodiimides is shown below:

$$R.C_6H_4.N{=}C{=}N{-}C_6H_4.R$$

They are easy to prepare by heating an alkylated aniline or similar aryl substance with carbon disulfide to produce a thiourea and then further reacting this substance with lead carbonate. The course of these reactions is shown below for the preparation of an auxiliary from cetyl aniline.



$$C_{16}H_{33}.C_6H_4.N{=}C{=}N.C_6H_4.C_{16}H_{33}$$

These auxiliaries are applied to all kinds of textile materials from organic solution (about 1 per cent is sufficient). After removal of the solvent by evaporation, the impregnated material must then be baked for one to two hours at 110 to 125° C.

It would seem that in application of all these newer water repellent auxiliaries the final baking at a high temperature is essential. The high temperature serves to bring about chemical combination of the auxiliary (or part of it) with the fibers and without this the resulting effects are much less permanent.

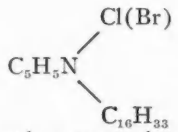
INCREASING THE FASTNESS OF DYEINGS TOWARDS WATER

Apart from softening and water repellency there is a third important use to which auxiliaries containing fatty acids or alcohol residues can be put, that is, increasing the fastness of dyed materials. For cellulosic fibers such as cotton, linen, viscose and cuprammonium rayons the most easily applied dyes are those of the direct class. But they all, or nearly all, suffer from one serious defect. The colors which they yield are lacking in fastness to washing and perspiration. To overcome this has long been the aim of dyemakers. They have overcome this lack of fastness to some extent by appropriate modification of the dye constitution but this expedient has only very limited application. In consequence there has been a search for auxiliaries which can be applied to the dyed material so as to fasten the dye and make it resistant to aqueous liquors.

In general, the auxiliaries which have so far been discovered along these lines of research, are of a type which form water-insoluble or difficultly soluble salts with the dyestuff. But a certain degree of success has also been obtained by utilizing auxiliaries which may or may not affect the dye but which do make the textile material more water repellent. It will be understood that there is difficulty in soaping off a dye from a colored material if the fiber pores do not open sufficiently to allow the dye particles to leave the fiber. A water repellent auxiliary can have the effect of closing these fiber pores and thus it indirectly contributes to an increase of fastness to washing.

One of the earliest auxiliaries introduced for increasing the fastness to water and perspiration of direct dyeings was Fixanol (I.C.I.). It is now known to be a quaternary ammonium compound containing a pyridine nucleus. Since then a considerable number of complex organic auxiliaries having this type of structure and characterized by having high molecular aliphatic groups within the molecule have been prepared.

In the manufacture of Fixanol use is made of the fatty alcohol which in turn is made by catalytic hydrogenation of the fatty acid. The alcohol is converted into its chloride or bromide and this is then additively combined with pyridine to form the quaternary ammonium auxiliary. Thus Fixanol is probably cetyl pyridinim chloride but the corresponding bromide is similar in its properties. This substance has the following formula:



The properties of such compounds are mainly governed by the fatty residue (cetyl, stearyl, lauryl, etc.) attached to the nitrogen atom of the pyridine nucleus.

In applying these substances to the dyed textile material it is generally sufficient to work the material in a dilute warm solution of the auxiliary, then lightly rinse, and dry. Sometimes this treatment causes a change of shade and this must be allowed for. It has also been found that the fastness to light may be affected adversely with certain auxiliaries which would otherwise be very satisfactory viewed from the standpoint of increasing washing fastness. This is just an example of the general experience of auxiliary manufacturers that it is most difficult to use a substance for improving one property of a textile material without at the same time harming another property.

Lately it has been found that high molecular weight ketens are able to give textile materials water repellent properties and while these may not be considered as available commercially just yet it is as well that they be considered. Keten is a peculiar substance having the formula, $CH_2{=}CO$, and may be regarded as the dehydrated product of acetic acid. It has the special property of being able to add itself directly to substances containing a free hydroxyl group and in so doing it produces the same effect as acetylation but there is no accompanying liberation of water as is the case when acetic acid is used for acetylation. This reactivity of keten is thus additive.

The low molecular weight ketens have been used for acetylating silk and cellulose, but recently it has been found possible to prepare high molecular weight ketens from fatty acids and their derivatives and these have special water repellent properties. It is apparently not satisfactory to attempt the preparation of such ketens by dehydration of the simple fatty acid but this can be done indirectly by first forming the acid chloride and then treating this with a tertiary amine to extract from it hydrochloric acid—the corresponding keten then results. These changes are shown below and since ketens are likely to find increasing use in textile treatment they are worth noting.

$$\underset{\text{Acetic acid}}{CH_3COOH} \longrightarrow \underset{\text{Keten}}{CH_2{=}CO} + H_2O$$

One novel idea for producing auxiliaries which can be applied to direct dyeings for the purpose of increasing their fastness to water is that of arranging that they contain a nucleus similar to that of many direct dyes so that these auxiliaries are substantive to the cellulosic fiber being treated. A large number of direct cotton azo dyes contain the benzidine nucleus since this confers on them substantive powers. Hence the use of this same nucleus in the auxiliaries is now being considered. Other nuclei suitable for this purpose are those to be found in dianisidine, 1:4-phenylene, 1:5-naphthylene diamine, and stilbene dyes. In addition to these special nuclei the

(Continued on page 423)

PROCEEDINGS OF THE

American Association of Textile Chemists and Colorists

AUGUST 4, 1941

Officers of the Association

CARL Z. DRAVES, *President*
General Dyestuff Corp., New York, N. Y.

ROLAND E. DERBY—THOMAS R. SMITH, *Vice-Presidents*

WILLIAM R. MOORHOUSE, *Treasurer*
National Aniline & Chemical Co., Boston, Mass.

HAROLD C. CHAPIN, *Secretary*
Lowell Textile Institute, Lowell, Mass.

LOUIS A. OLNEY
President Emeritus and Chairman of the Research Committee
Lowell Textile Institute, Lowell, Mass.

COUNCILORS
Representing Sections

FREDERIC A. PRISLEY; PETER J. ARIENTE (Rhode Island)
WILLIAM EBERSOLD; CHARLES A. SEIBERT; WILLIAM A. STRINGFELLOW (Philadelphia)
HENRY F. HERRMANN; GEORGE L. BAXTER; HAROLD W. STIEGLER (New York)
DEXTER R. KNEELAND; CLARENCE L. NUTTING; (N. New England)
H. E. KIEFER, JR.; A. HENRY GAEDE (Piedmont)
ROBERT W. PHILIP (South Eastern)
J. D. MOSHEIM (South Central)
VIRGIL T. HARTQUIST (Midwest)

Past Presidents

ELVIN H. KILLHEFFER; P. J. WOOD; ROBERT E. ROSE; WILLIAM H. CADY; ALBAN EAVENSON

Local Sections and Their Officers

Northern New England Section

John N. Dalton, Chairman, Pacific Mills, Worsted Division, Lawrence, Mass.
Edward S. Chapin, Secretary, W. C. Durfee Co., Inc., 114 Federal St., Boston, Mass.
Kenneth H. Barnard, Vice-Chairman; John H. Grady, Treasurer

Rhode Island Section

Ben Verity, Chairman, Carbic Color & Chemical Co., 68 Pine St., Providence, R. I.
Iver W. Fallstrom, Secretary, Arnold Hoffman & Co., 55 Canal St., Providence, R. I.
Howard V. King, Vice-Chairman; R. R. Farwell, Treasurer

New York Section

Harry R. Tisdale, Chairman, American Dyewood Co., 22 East 42nd St., New York, N. Y.
Norman A. Johnson, Secretary, American Dyestuff Reporter, 440 4th Ave., New York, N. Y.
Edward H. Schmidt, Treasurer; P. J. Kennedy, Vice-Chairman

Philadelphia Section

John F. McCoy, Chairman, Edgewater Dyeing & Finishing Co., 4080 Frankford Ave., Philadelphia, Pa.
James P. Conaway, Secretary, 5947 Belden St., Frankford, Philadelphia, Pa.
A. E. Jones, Vice-Chairman; George E. Kohn, Treasurer

Piedmont Section

L. M. Boyd, Chairman, Scholler Brothers, Inc., Salisbury, N. C.
T. W. Church, Vice-Chairman; R. D. Howerton, Treasurer
D. Stewart Quern, Secretary, Becco Sales Corp., 1000 West Morehead St., Charlotte, N. C.

South Central Section

Fletcher L. Kibler, Chairman, United Hosiery Mills, Chattanooga, Tenn.
Frank F. Myers, Secretary, Geigy Co., Inc., Chattanooga, Tenn.
Jack Anderson, Vice-Chairman; J. T. Bohannon, Treasurer

Midwest Section

Archie G. Alexander, Chairman, Phoenix Hosiery Co., 320 East Buffalo St., Milwaukee, Wis.
J. Gordon Stott, Secretary, Ciba Co., Inc., 325 West Huron St., Chicago, Ill.
F. L. Wilhelm, Vice-Chairman; J. S. Morrison, Treasurer

South-Eastern Section

Perrin N. Collier, Chairman, Callaway Mills, LaGrange, Ga.
Curt Mueller, Secretary, Bibb Mfg. Co., Macon, Ga.,
L. L. Bamberger, Vice-Chairman; A. R. Macormac, Treasurer

Lowell Textile Institute Student Chapter

Ernest Peter James, Chairman, Stanley Szopa, Secretary.

North Carolina State College Student Chapter

William S. Pearson, Chairman; George W. Funderburk, Secretary

Philadelphia Textile School Student Chapter

Joseph E. Dunson, Chairman; Robert J. Wiley, Secretary

Members should notify the **Secretary** immediately of all address changes

CALENDAR OF COMING EVENTS

Annual Meeting and Convention, Carolina Hotel, Pinehurst, N. C., Oct. 31, Nov. 1, 1941.

HEAT TRANSMISSION
through Textile Fabrics*

EDWARD R. SCHWARZ, F.T.I.**

HEAT is a form of energy as are light and electricity and behaves in much the same way. It is vibratory in nature and travels by three methods,—conduction, convection and radiation. In a given body increase in heat is evidenced by rise of temperature and increase in the rate of vibration of the molecules composing the substance. Below 550 degrees Centigrade iron may be much too hot to touch safely but yet be still "black." At 550 degrees Centigrade it becomes red hot, and at 1300 degrees Centigrade is white hot. If the temperature is still further raised the iron will be converted into liquid and eventually into gas. Each of these phases involves increased rates of molecular vibration and greater degree of freedom of motion of the molecules. Energy vibrations between 400 trillion per second and 800 trillion per second are visible as light. When the vibration rate is less than 400 trillion per second, the energy is perceptible as heat but is no longer visible.

Whenever heat flow takes place it is always from a higher temperature level to a lower. In this it behaves like electricity which flows in accordance with the magnitude of the voltage drop or like water which flows in proportion to the hydraulic head. For convenience of comparison therefore a coefficient of heat flow (coefficient of thermal conductivity) may be measured in terms of the quantity of heat flowing per degree difference in temperature. It is obvious that the quantity flowing through a given substance will depend upon the area exposed to the heat, the temperature difference between the two sides of the substance, the length of time during which the heat flows and the length of the path through the substance travelled by the heat. The quantity of heat flowing varies directly with the first three factors and inversely with the fourth.

Heat may be absorbed by a substance and the quantity thus picked up will depend upon the weight of the substance together with the temperature change produced and the length of time the process lasts. It thus becomes possible to measure the flow of heat through a material if a constant temperature source can be arranged to send heat through the sample under test and into a receiver of known capacity. For precise measurements all the heat that passes through the sample must enter the receiver and in the past this has involved elaborate precautions in the form of guard rings or other devices to prevent the flow of heat in any but the desired direction. In most instances the amount of heat which had to be supplied to the source in order to exactly make up for that lost through the sample was measured in terms of electrical or other energy; or else the rate at which the source of heat cooled was determined. These tests required expensive and cumbersome apparatus and a long time to complete the measurements.

The present equipment (see Figs. 1A and 1B) applied to a study of heat transmission through textiles in the

Fig. 1A—M.I.T. Heat Transmission Tester in Use.

M.I.T. Textile Research Laboratory involves another principle—namely that of catching the heat which passes through the sample in a receiver of known heat capacity and by a means of measuring the change in temperature of this receiver relative to the constant temperature of the source to determine how much heat has been picked up. It can be shown mathematically that if there is no heat lost in the process it is possible to plot the readings of a gal-

*Abstract of a paper presented March 28, 1941, before the Rhode Island Section.

**Professor of Textile Technology, In Charge Textile Division, M.I.T.

vanometer which measures the difference in temperature between the receiver and the constant temperature source

Fig. 1B—M.I.T. Heat Transmission Tester between Tests.

against the time elapsed since the beginning of the test. If this is carried out with the galvanometer readings measured along a logarithmic scale and the time readings measured along a uniform scale (see Fig. 5), the result will be a straight line. Should any loss of heat occur, the fact is evidenced immediately by a curvature of the plotted line. Thus it is possible to stop the testing before the line begins to show any signs of curving and this usually involves a test of not over fifteen minutes' duration.

It can further be shown mathematically that if a constant factor determined from the known dimensions and properties of the measuring system be divided by the time in minutes corresponding to a given galvanometer reading the result will be the conductance of the sample expressed in calories per second per degree Centigrade.*

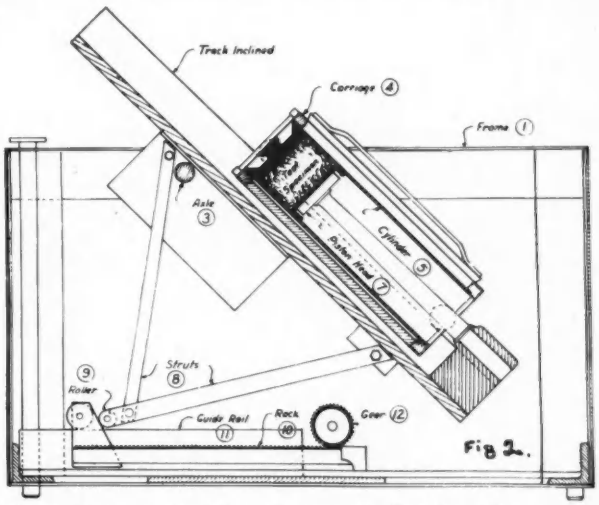


Fig 2—Constant Loadrate Autographic Resilience Tester for Fibers.

After the conductance has been computed by simple division of the elapsed time into the desired factor, it is possible to obtain the coefficient of thermal conductivity by multiplying the conductance by the length of the heat path in inches and further to determine the reluctance to heat flow (the insulating power of the material) by taking the reciprocal of the conductance.

The apparatus employed in the investigation is illustrated in Figure 1 and has been described in greater detail by the author in "Rayon Textile Monthly" for September and October 1940. It consists fundamentally of a calorimeter container into which is placed a liquid which is maintained at constant temperature either by reason of boiling or by use of thermal regulators. In the base of the calorimeter is inserted a copper block into which has

*A calory is the amount of heat required to raise one gram of water through one degree Centigrade.

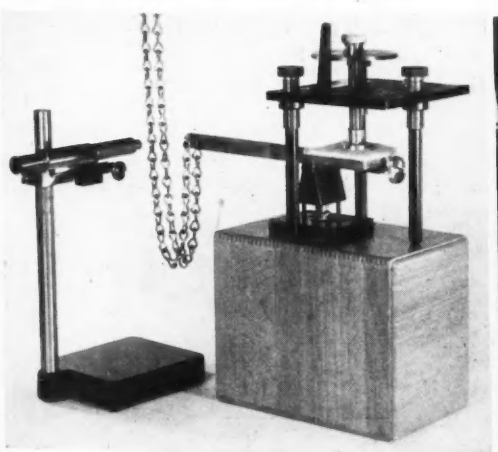


Fig. 3—Resilience Tester for Fabrics and Yarns.

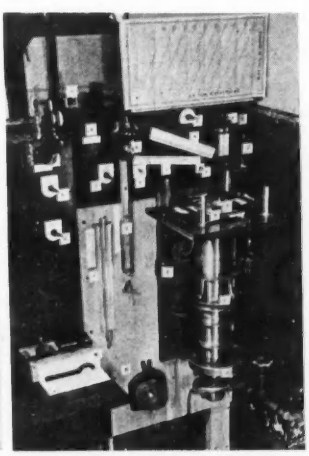
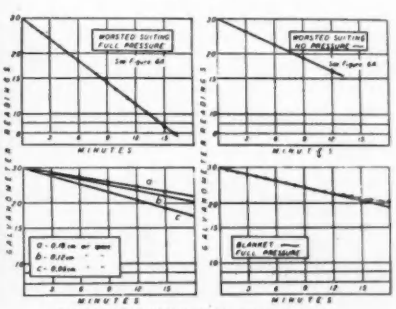


Fig. 4—Left—Air Permeability Tester Which Can be Used in Conjunction with Heat Transmission Studies.

Fig. 5—Below—Typical Heat Transmission Charts.



TYPICAL HEAT TRANSMISSION TEST CHARTS

been placed one junction of a thermocouple connected in series through a resistance (used to control the sensitivity of the galvanometer) and an extremely sensitive galvanometer. In this same circuit and in series with it is the second junction of the thermocouple which is embedded in a copper block known as the receiver which in turn is thoroughly insulated by cork so that heat lost from it is definitely minimized. This arrangement serves as a very delicate means for determining the rate at which the change in temperature between the constant temperature source and the receiving block varies and this rate of change is a function of the slope of the resulting plot. It is thus possible to make a very rapid comparison between different materials of the same or different thicknesses by simply plotting the data and studying the relative positions of the resulting straight lines.

Air is a very good insulator and if it were possible to reach down to the foot of one's bed and pull up over the body a thin sheet of still air there would be no need for textile materials of any sort as protective covering. However, the textile material appears by reason of its strength, lightness and flexibility to be essential and it serves simply to trap a large number of small volumes of relatively still air and to keep these small, dead-air spaces in a constant position relative to the body. In order to do this efficiently the fibers composing the fabric must be arranged in such fashion as to effectively prevent the formation of straight-line passageways through the material and to provide what one manufacturer of blankets has called "nap traps." It is possible by micro and other analysis (Fig. 4) to determine the nature of these air spaces and to predict in many instances the efficiency of the fabric as an insulator against heat flow.

It is necessary that the fibers composing the textile fabric be notably resilient in order to maintain the trapped air in an optimum condition. Thus wool has been used for this purpose for a great many years and still proves extremely satisfactory. (Fig. 2). The newer artificial fibers, however, offer definite possibilities in this regard and further investigation of the resilient properties of fibers in general will be of tremendous importance in the proper design of fabrics for both insulation against heat and for the more ready transmission of heat. The latter condition is of importance, of course, in the design of tropical men's wear or summer suitings. Again, clothes form an elastic cushion for the purpose of trapping air in their own structures and also to maintain relatively still air space between the fabric and the surface of the body. These conditions are maintained by the compressional resilience, tension elasticity and flexural rigidity of the materials (Fig. 3) and these properties are now capable of measurement with some degree of precision and thus make laboratory determinations along these lines of considerable importance to the ultimate consumer of textiles. Progress in textile technology in the directions indicated has been rapid over the last few years and noteworthy in this particular connection is the study sponsored at the Massachusetts Institute of Technology by the A.A.T.C.C. Research Committee on the measurement of flexibility and drape of fabrics. Work is also underway at M.I.T. under the sponsorship of the Textile Foundation on the precise measurement of the resilience of fiber, yarn and fabric both in masses and in the form of finished materials.

In evaluating the results of tests by usual methods including that just outlined, the reader must bear in mind that it is seldom possible to duplicate service conditions in the laboratory. The technician seeks rather to duplicate the results of a service condition and a great deal of work must still be done in making the transition from laboratory practice to actual service. This should be more readily possible with apparatus available on which tests can be completed in the matter of a few minutes and where the expense of equipment is reduced to what is believed to be very nearly a minimum value.

For the mathematically inclined the treatment indicated in the appendix to this paper will be of interest in showing the derivation of the expressions used for the computation of conductance, reluctance and conductivity. It is hoped that there will be even greater activity along the lines discussed and that further important and interesting information will result.

APPENDIX

Heat Transmission

Heat flow through specimen:

$$\frac{dH}{dt} = -\frac{KA}{L}(T\text{-}T_o) + K'(R\text{-}T) \qquad (1a)$$

where H is the heat flow in calories
t is the time in seconds
K and K′ are coefficients of heat transmission
A is area of sample in sq. cm.
L is length of heat path (fabric thickness)
T is temperature of receiver in °C.
To is temperature of source in °C.
R is temperature of room in °C.

Heat flow into receiver:

$$\frac{dH}{dt} = MS\frac{dT}{dt} \qquad (1b)$$

where M is mass of receiver in g.
S is specific heat of receiver in cal./g./°C.
Equating (1a) and (1b)

$$MS\frac{dT}{dt} = -\frac{KA}{L}(T\text{-}T_o) \qquad (2)$$

if second term of (1a) is neglected.

Galvanometer:

$$I_g = c\,(T\text{-}T_o) \qquad (3)$$

$$\frac{dI_g}{dt} = c\frac{dT}{dt} \qquad (4)$$

Substituting (3) and (4) into (2)

$$MS\left(\frac{dI_g}{dt}\right) = -\frac{KA}{L}(I_g) \qquad (5)$$

or

$$\frac{dI_g}{I_g} = -\frac{KA}{MLS}\,dt$$

and

$$\int_{I_0}^{I_g}\frac{dI_g}{I_g} = -\frac{KA}{MLS}\int_0^t dt \qquad (6)$$

Integrating (6) and taking limits:

$$\ln I_g - \ln I_o = -\frac{KA}{MLS}\,t \qquad (7)$$

Converting to base ten logarithms:

$$2.303\,(\log I_g - \log I_o) = -\frac{KA}{MLS}\,t$$

or

$$\log I_g = \frac{-KA}{2.303\,MLS}(t) + (\log I_o)$$

But for the galvanometer adjustment used:

$T = 100°C.$
$T_o = 21°C.$
$I_o = 30$

so that

$$\log I_g = \frac{-KA}{2.303\,MLS}(t) + \log 30 \qquad (8)$$

This is the equation of a straight line with a slope of

$$\left(-\frac{KA}{2.303\,MLS}\right)$$

If I_g is plotted on a log scale against the corresponding time (t) on a uniform scale, a straight line will result so long as the term [K'(R-T)] is negligible or zero—in other words so long as there are no losses in the fabric-receiver system.

For the case of unit distance on the ($\log I_g$) scale suppose $t = t_3$ when $I_g = 3$ and $I_o = 30$

then $\log 3 - \log 30 = -1$

and

$$\frac{-1}{t_3} = -\frac{KA}{2.303\,MLS} \qquad (9)$$

or

$$K = \frac{2.303\,MLS}{A\,t_3} \qquad (10)$$

Substituting the constants of the apparatus and converting to proper units:

$$K = \frac{2.303\,(340)\,(.093)\,(4)\,(2.54)\,(L)}{\pi\,(1.73)^2\,(2.54)^2\,(60)\,(t_3)}$$

where $M = 340$ g.
$S = .093$ cal./g./°C.
$L =$ heat path in inches
diameter receiver surface $= 1.73$ ins.
t_3 is in minutes.

$$K = \frac{0.2037\,L}{t_3} \qquad (11)$$

dimensionally $K = \dfrac{g\,.\,cal\,.\,cm}{g\,.\,cm^2\,.\,sec\,.\,°C} = \dfrac{cal}{cm\,.\,sec\,.\,°C}$

Now $K = CL$

since the greater the value of L the smaller C will be.

From (11)

$$C = \frac{0.2037}{t_3} \qquad (13)$$

and $R = \dfrac{1}{C}$ where R is the reluctance to heat flow.

In practice it is simple to compute C, K, and R as follows:

For $I_g = 25$ and $t = t_{25}$

from (9)

$$\frac{\log 25 - \log 30}{t_{25}} = \frac{-KA}{2.303\,MLS}$$

or

$$K = \frac{.0792\,(0.2037)\,L}{t_{25}} = \frac{0.016\,L}{t_{25}} \qquad (14)$$

$$C = \frac{0.016}{t_{25}} \qquad (15)$$

Similarly for $I_g = 20$

$$K = \frac{0.036\,L}{t_{20}}, \qquad C = \frac{0.036}{t_{20}} \qquad (16)$$

and for $I_g = 15$

$$K = \frac{0.061\,L}{t_{15}}, \qquad C = \frac{0.061}{t_{15}} \qquad (17)$$

MEETING, R. I. SECTIONAL COMMITTEE

AT a meeting of the Rhode Island Sectional Committee at the Warwich Country Club on July 10, 1941, Howard V. King was appointed Chairman of the Program Committee for the coming year. Thomas H. Roberts, Chairman of the Sectional Paper Committee, has chosen for his committee E. J. Allard, Nelson Barlow, Elliot Broadbent, Melva E. Davis, Robert R. Farwell, Stanley I. Garnett, Fred G. LaPiana, Hector G. Macdonald, John Martin, George Prime, Frederic A. Prisley, S. R. Warburton and Ben Verity.

Respectfully submitted,

IVER W. FALLSTROM, *Secretary.*

NATIONAL DEFENSE*

S. W. CRAMER, Jr.

I AM glad to be with you this evening, because your contribution to the textile industry has always seemed to me one of the most important and delightful of all the steps that produce a finished piece of cloth. Since I resigned from the Army, every once in a while I run into one of my old comrades in arms, who inquires how I am fitting into my changed environment, how I like my new life, and whether I find my work interesting or dull. My answer has always been that while sometimes when I stop to think about it I feel some homesickness for my old military life, I seldom think about it. Textile manufacturing is so tremendously absorbing that I am inclined to forget that other fields of activity ever took up my entire time and thought.

Our industry uses a number of different processes, each one entirely worthy of anyone's best efforts. But of them all the most thrilling is certainly that which causes the final transformation from something purely utilitarian into a thing of beauty. It is not difficult to imagine how fascinating it must be to one with a mechanical turn of mind to study the many intricate machines we use. These machines on the other hand, are only the tools of men, who furnish still more interesting problems of personnel policy and labor relations. The balancing and intergrating of all those men and machines into the most harmonious and productive result is a task to stimulate anyone's organizational imagination to the fullest extent. For those who like to trade, there are limitless possibilities and satisfactions in the distributional problems involved in persuading the public to buy the things which one has made. But as I said above, as a matter of pure pleasure and delight, there are very few other occupations which could possibly be more satisfying than that which takes a piece of woven or knitted cloth, having only intrinsic merit but no charm whatever to the hand or eye, and transforms it into something lovely to see and feel. The use of color for decoration is as old as the history of mankind, and those who use color intelligently and effectively will draw upon the experience and history of one of the most ancient of the decorative arts; at the same time, modern science is utilized to the fullest not only to produce new and more pleasing hues and textures, but also for the purpose of obtaining the known and established ones at a lower cost to the consumer. Many books have been written on this subject, and more are being written every day, so I shall not dwell further upon this subject, except to suggest that he who can lend color to an otherwise drab existence creates much happiness both for himself and others.

*Presented at meeting, Piedmont Section, April 19, 1941.

In speaking of the importance of adding beauty to the plain warp and weft of life, it is significant that we seem to be approaching—if we haven't already reached—a period when beauty is going to be a rarer luxury than ever, and when we shall have to concentrate upon and be satisfied to an increasing degree with the mere necessities of life. Today the surge of men's activities is toward the purely practical and away from the pursuit of beauty. A good part of mankind is engaged in a bitter struggle for existence and bare survival. Millions of men—and women too, for that matter—are so preoccupied with the problem of just keeping alive, and they are finding it so increasingly difficult to obtain for themselves the necessary minima of food and clothing, that no energy remains available for the delicacies of life, such as good cooking and fine raiment.

We have all become so war conscious that it is not surprising that when I was asked to speak to you this evening it was suggested that my remarks be directed toward National Defense. I would probably not have been asked to speak on any other topic, nor should I have accepted, if asked, having neither the gift nor training for public speaking. But, so over-powering is the necessity for arming America that I am ready and glad to do anything I can toward that end.

For many months past I have done little beyond following the progress of National Defense by taking part in the discussions, as well as by reading and studying the reports of the sundry groups in this country dedicated to the solution of various angles of that vital problem. If I do not know quite all the answers, I could assuredly give you a fairly good report on the actual progress to date of the national defense effort.

I might sketch the progress of our armament effort in the last war, leading up to the establishment of Mr. Baruch's War Industries Board. You might be interested in statistics on the rate of mobilization of our armed forces, in the progress of the productive effort, in figures showing the delays and interruptions of production programs resulting from strikes and other causes. You might want to know to what extent priorities have already been inaugurated, and the methods of their application. As a part of this picture, you might like to hear about the estimated cost of our rearmament effort, of the contracts placed under appropriations made by Congress, and of ways and means under consideration for defense financing, including the various forms of taxation. One might describe the O.P.M.'s efforts to spread the practise of subcontracting, and the degree of success so far attained.

Perhaps you know that reluctant as the Government has been to disturb normal business relationships by such methods as price-fixing, ceiling prices have already been established for certain commodities and products. It might be worth while to point out the difficulties and objections to the general establishment of fixed prices, with the interrelated question of fixing wages; or to explain the methods of procedure followed by the Government in a limited number of cases where a ceiling price has been fixed, or where prices on competitive bids have been forced down to a lower level by negotiation between the Government and the contractor. We might discuss the emergence of new policies designed to assist the voluntary cooperation of manufacturers in this important question of prices, and the apprehension toward using such methods felt by nearly all manufacturers because of the Anti-Trust Laws.

For example, it has been suggested to industry that under certain conditions groups could get together and voluntarily fix ceiling prices on their products without fear of Federal indictment, under the promise by the O.P.M. that Thurmond Arnold would "keep his eyes fixed on the floor, while Leon Henderson would watch the ceiling." There are difficulties in the way of accepting that invitation, such as the danger of violating an existing law under this promise of immunity, due to the fact that Government policies can be changed over-night without formal action, while the statutes remain in force until formal legislative action is taken. Not to mention the obvious fact that while the Administration might be able to protect such a group of manufacturers from criminal procedure, it would have no power to prevent the institution of a civil suit and the collection of damages by any individual who might consider that he had been injured by those participating in the illegal agreement.

Probably you are already familiar with the positions taken by the important industrial groups such as the Cotton-Textile Institute, and the American Cotton Manufacturers Association for our own textile industry, the National Association of Manufacturers, the National Industrial Conference Board, and the National Chamber of Commerce for business in general, on all these important subjects. These perplexing problems have been studied by suitable committees of those organizations, and in most cases public statements have been issued defining the attitude and policy of those important business groups toward the particular question.

All those things are matters of very great interest to us, but I might point out that they are essentially matters of day-to-day procedure and subject to change without notice in conformity with the rapidly changing world picture and the vital needs of our own country as they become clarified. And so I am going to take the possibly foolish course of leaving a subject that I know a good deal about and going on to one about which I know very little indeed. I am going to touch upon some of the disturbing questions which have been keeping me awake at night for months, and for which I have *not* the answers. These questions relate to general principles, not to routine procedure. If we can find the correct answers to these fundamental questions, they will serve as beacons on our course. Possibly there are some who feel that they know exactly where we are going, and how to get there. As for me, it is all so chaotic and jumbled that I can perceive only a few glimpses of the form and direction of the monstrous forces that are tearing the world we knew asunder. I feel very much as some of our pioneer forebears must have felt a hundred and fifty years ago as they toiled along the rough trail of one of these gaps through the mountains of western North Carolina. They were beset by danger and hardship along the road, they had only a dim and vague idea of the land toward which they were heading; they could only trudge along praying that they would be preserved from the perils of the journey and in the end find a haven not worse than the one from which they came.

Incidentally that surge of colonization from the Atlantic seaboard across this continent furnishes an apt illustration of the difficulty of judging the righteousness and abstract morality of national behavior. When the white man, impelled by what he considered his "vital interests" pursued his policy of "peaceful penetration" further and further Westward, and when the government behind these early settlers felt it necessary to protect them against the "intolerable treatment" they were receiving at the hands of the redskins, it must have appeared to the latter as a nearly perfect specimen of deliberate "infiltration," "Fifth Column" activity and finally "unwarranted aggression." It may even be that upon occasion the American Indian had some cause to complain of the tendency of the white man's government to violate its pledges and to consider its solemn treaties as "scraps of paper." Mexico too had reason to feel the pressure of the expansive energy of the young American nation when its tide swept up against and then over her outposts in Texas and California.

Yet who today would condemn the men or methods that resulted in the winning of this vast and rich country for ourselves and our children? We are justly proud of our Daniel Boones, Davy Crocketts and Sam Houstons. We are grateful to Senator Thomas Benton, of Missouri (who by the way was a native North Carolinian) for his vision of "Manifest Destiny" and for the persistence and adroitness with which he used his son-in-law, Captain Fremont, in his program for bringing our frontier to the Pacific Ocean. Those were early days along the path of American history—back beyond the horse and buggy days to the covered wagon era. The expansive force of the young Republic was irresistible, and maybe at times a bit ruthless. Was it right? Was it wrong? I don't know. Probably it contained a great deal of virtue, mixed with a little sin, like most of us individuals. At all events our grandfathers carved out of this continent a pretty good country for us, where we have been able to build what I firmly believe to be a better way of life than the world

has ever seen before. Good men, honest men, differ on national policy, but every good American can and does echo the ringing words of Stephen Decatur: "Our country! In her intercourse with foreign nations may she always be in the right; but our country, right or wrong."

During the period of our own growth as a nation England had gained control of the seas, and was building up a mighty colonial empire. Her maritime supremacy might not have been so easily achieved but for her interference with our own vigorous and budding sea power, and curiously enough it was not so much the two wars we fought with her that gave us the worst set-backs at sea, but her connivance with Confederate sea-raiders during our Civil War that gave the final "coup de grace" to our own bid for naval supremacy. I don't pretend to know much about the ethics of the acquisition of her far-flung empire, although some accounts present a rather murky and sordid picture. I feel neither competent nor inclined to judge whether she justly deserves to be called "Perfidious Albion." I like and admire the English people individually and collectively. I believe that by and large Britain's influence on the rest of the world has been more beneficial than harmful. And still more important, I perceive the fact that circumstances have made of her our last powerful ally in a war-torn world.

It is quite obvious that we are now witnessing in Europe one of the greatest expansive movements in history, with an explosive force only matched in the times of Alexander, Genghis Kahn or Napoleon. Those are names of people and the importance of the man Hitler in this picture is not to be ignored: the effects of the impact of a dynamic personality upon his environment are incalculable. More important still, however, is the undercurrent of world trends that furnishes such a fish with a medium through which to swim. There is a ferment working throughout the world that has for some time been turning everything upside down, tearing down venerable institutions and destroying the old authorities. The ferment broke out in Russia, and spread like wildfire throughout both hemispheres. When it threatened to engulf Germany Hitler rose. He fought the fire of the Bolshevik dragon with a motheaten dragon of his own, dragged out of the garret of Teutonic Legend and fed upon the tough raw meat of Nazi ideology. Pretty soon the Nazi dragon had pushed the Bolshevik dragon back into its lair, cowering and afraid. Dragons like red meat and during the past couple of years the Nazi dragon has had a number of pretty good meals, while the Bolshevik dragon has been on a rather light diet and perhaps lost some of his strength.

Which was the good dragon, and which the bad? Or are they both bad? Or both good? Again I don't know. A good many Americans, some in pretty high public office, seemed to think the Bolshevik dragon had some pretty good points. Even now some of our most honest and decent citizens appear to consider the Nazi dragon as not altogether wicked. Well, maybe both dragons are good for their own lands; if their people think so what do we care, provided they stay at home and mind their own business? But it becomes increasingly plain that both dragons are making life pretty tough for their neighbors, that they are becoming an increasingly serious menace to our health and happiness, and that they will gobble us up if we don't watch out.

Of course as long as Hitler's dragon is snorting fire and brimstone in the direction of Moscow, we haven't much to fear from that quarter. You would think that frightened as he must be Stalin would be glad to see some effective opposition to Berlin, but there is abundant evidence that the external revolutionary agency of the Kremlin, the Commintern, while cowed and playing "doggo" closer home, is keeping up its customary game of sabotage and demoralization in more remote countries like our own. Maybe they keep it up just because they still have the organization, and don't know what else to do with it. On the other hand, maybe Stalin, in spite of a slight divergence in ideology, has concluded that as matter of practical politics, he had best be on Hitler's side. In any case Hitler's dragon is the one for us to watch, whether the other little dragons will really hunt with him or nip at his heels if they get a chance.

The Nazi dragon had pretty easy picking until he ran up against the British Isles. There he found to his surprise and consternation that the English too had rummaged in a closet of old Saxon mythology, to bring forth a patron Saint with an already well established reputation for slaying dragons. St. George was standing right there, across the English Channel, with his armor all shiny and bright, and with a new sharp sword in his hand. St. George is still standing there, my friends, defying the dragon to stick one foot into the Atlantic Ocean. And that is why we, whose shores are lapped by that same Atlantic Ocean, are going to do all we can to help keep his armor bright and his sword sharp.

* * *

If in describing the world situation I have resorted to the parlance of bed-time stories, it is by no means in a spirit of levity. Believe me, the Nazi dragon is no childish bugaboo! I have done so with the deliberate intention of reducing the picture to such simple lines that we can see it clearly. I have heard and read so many complicated arguments on various aspects of the National Defense question, often clothed in such elaborate language, that I am frequently quite unable to discern the essential facts behind the words. Perhaps some of you have experienced the same difficulty in "seeing the forest for the trees."

Let's keep it as simple as we can and see where we land.

It is quite obvious that the term National Defense means the defense of our nation. The phrase "our nation" certainly means those people who are voluntarily banded together with us under a common government, and that part of the earth's surface which we collectively possess

and inhabit. Some people consider that it includes certain racial characteristics, traditions, institutions and ways of life; others insist that it should be stretched to embrace such political and social theories as "democracy" or "a more abundant life."

Well, insofar as racial characteristics are concerned, we haven't any yet. As for traditions we have already, in a short hundred and fifty years of national existence, begun breaking them wholesale with no pressure from without. Institutions and ways of life are changing rapidly in the natural course of progress from the "horse and buggy days" to the machine age. Those things are neither uniform nor fixed, but diverse and mutable. In nations which have long endured those elements have suffered many striking changes without affecting the existence or identity of the nation itself.

Some people seem to want to shed their blood for democracy. Others aver that we started out as republic, and never have been a democracy. I have even heard people charge that Mr. Roosevelt was running a close race with Hitler in leading his country into National Socialism. Certainly "New Dealism" bears so little resemblance to the democracy of Thomas Jefferson that he might well have some difficulty in recognizing it. All that is highly controversial and argumentative, so let's cut it out of the National Defense picture, too.

What we can all agree on, I think, is that we want to defend our soil and our homes. On that soil of ours we want to be left alone to work out our salvation in our own way, without outside interference. For that privilege we are ready and willing to fight, just as we have always known that we would have to fight for it. For that privilege is national freedom, which like any other worthwhile thing is not a gift but a victory won with sweat and blood. We may make mistakes in self-government, but we have only ourselves to blame, and we can correct them if we choose.

I believe we can agree too that the only two ways of defending any nation are by diplomacy or armed might, or a combination of the two. Also that we would prefer to rely upon diplomacy and negotiation as far as we can with honer and safety. Now that our own and foreign diplomacy have failed to preserve the peace of nations with its concommitant security for this country, we find ourselves in need of arms. We need all the arms we can produce, and we need them urgently. "Too little and too late" is the croak of the 1941 raven.

What kind of weapons do we need, and how should we employ them? Those are questions for the political and military experts of the government to decide. So also is the question of how much aid should be given to other nations. It would appear advisable for us to help every actual or potential ally to the maximum extent that does not impair our own fighting power, but beyond that we can hardly go. It is not our responsibility, but government's. While generalizing it might be well for us to remember that the old military axiom that "the best defense is a vigorous offensive" has been abundantly justified in recent months, but we are hardly in a position to direct the national strategy. That responsibility, too, is government's.

What then as private citizens can we do to help? Oh, there are plenty of ways that we can help, and the help that we the people alone can give is so vital that without it the best efforts of our government and of its armed forces will be unavailing.

First we can forget politics, class distinctions and differences of opinion, joining as a united people in support of the President and the Congress, in whatever policies they may decide upon. Without unity there can be no possible victory. It may be that certain politicians will take advantage of the opportunity to rob us maliciously of some of the rights and freedoms that we greatly cherish, but I would rather take a chance after the struggle of throwing off that yoke than the yoke of a foreign invader.

Which reminds me of a sidelight on the danger that threatens us which strikes me as so extremely important that I am amazed to have seen it so seldom mentioned by the analysts and commentators. I refer to the vastly increased powers of suppression today as compared to any earlier period in history. Two thousand years ago it was easy enough for any of the subject nations on the fringe of the mighty Roman Empire to start a rebellion. All they had to do in Britain, Spain, Parthia or Scythia was to hide swords and spears under the floors of their huts, bring them out at the moment agreed upon by the conspirators, fall upon and kill the small Roman garrison. They were then free until the Roman legions arrived several months later, putting the land to fire and sword, and usually putting down the revolt eventually. Thus Rome ruled her frontiers not by immediate control, but by the threat of distant punishment. This condition remained largely true as long as men still marched on foot or horseback and fought primarily with small arms that could be conveniently hidden. Consider the contrast today: planes and tanks cannot be hidden under floors or in bedding, depriving the would-be rebel of the arms necessary to revolt; if anything does start bombers and troop transport planes can be on the scene in a matter of minutes, while within a few hours tanks and armored cars, which the rebels have no possible means of stopping, arrive and blast the insurrection into bits. Make no mistake about it: if you once get down you will find it much harder to get up than ever before!

Hardly less important than united support of our government is the obligation to work our hardest to produce the munitions and supplies needed by our expanding Army and Navy. Wars of todays are won more by industrial production than by tactical skill. I will not say that the proper armament outweighs the courage and steadfastness of the individual soldier, because the best equipment would

(Concluded on page P420)

ANNUAL MEETING

THE CAROLINA HOTEL

GENERAL PLANS

General plans and committee personnel for the Annual Meeting and Convention of the American Association of Textile Chemists and Colorists, to be held at the Carolina, Pinehurst, N. C., October 31-November 1, have been announced by Arthur R. Thompson, Jr., of Ciba Company, Inc., Charlotte, N. C., Publicity Chairman for the Piedmont Section, which is to be the host for the convention.

The convention will open with registration on Friday morning, October 31. Friday afternoon will be devoted to technical sessions, and on Friday evening a program of entertainment will be presented under the auspices of the Piedmont Section.

Another group of technical sessions will be held on Saturday morning, November 1, with golf, tennis, skeet shooting, bridge and sight-seeing trips on Saturday afternoon. The convention will conclude with the annual banquet on Saturday evening.

Hotel reservations should be made direct to D. Stewart Quern, 1930 Harris Road, Charlotte, N. C., who is chairman of the reservations' committee.

OCTOBER 31ST

AND CONVENTION

PINEHURST, N. C.

COMMITTEES

SAMUEL L. HAYES
General Chairman

General Committee

Samuel L. Hayes, Chairman—Ciba Company, Inc., Charlotte, N. C.
L. M. Boyd—Scholler Bros., Salisbury, N. C.
D. Stewart Quern—Becco Sales Corporation, Charlotte, N. C.
T. W. Church, Jr.—Highland Park Mfg. Co., Charlotte, N. C.
A. Henry Gaede—Laurel Soap Mfg. Co., Charlotte, N. C.
H. E. Kiefer, Jr.—Ware Shoals Mfg. Co., Ware Shoals, S. C.
R. D. Howerton—Calco Chemical Co., Charlotte, N. C.

PUBLICITY COMMITTEE
A. R. Thompson, Jr., Chairman
Ciba Co., Inc.
Charlotte, N. C.

RESERVATION COMMITTEE
D. Stewart Quern, Chairman
Becco Sales Corp
Charlotte, N. C.

REGISTRATION COMMITTEE
R. D. Howerton, Chairman
Calco Chemical Co.
Charlotte, N. C.

FINANCE COMMITTEE
T. W. Church, Jr., Chairman
Highland Park Mfg. Co.
Charlotte, N. C.

ENTERTAINMENT COMMITTEE
L. M. Boyd, Chairman
Scholler Bros., Inc.
Salisbury, N. C.

SPEAKERS COMMITTEE
Douglas C. Newman, Chairman
E. I. du Pont de Nemours & Co., Inc.
Charlotte, N. C.

GOLF AND TENNIS COMMITTEE
J. D. Sandridge, Chairman
E. I. du Pont de Nemours & Co., Inc.
Charlotte, N. C.

SKEET COMMITTEE
Joe Moore, Chairman
Calco Chemical Co.
Charlotte, N. C.

RECEPTION AND INFORMATION COMMITTEE
Robert A. Bruce, Chairman
Amalgamated Chemical Corp.
Greensboro, N. C.

NOVEMBER 1ST

The Use of FIBERGLAS IN TEXTILES*

PAUL W. BOOHER and EDWARD AMES
Owens-Corning Fiberglas Corp.

MR. BOOHER: I have with me a film narrated by Edward Ames that not only shows you Fiberglas in textiles but also shows Fiberglas in wool form. After this film has been shown, I will show you the types of Fiberglas discussed in the film and will further discuss their uses. I then will open this session for questions, and I want you to feel free to ask any question.

. . . (Here followed the showing of the film) . . .

* * *

Narration

By EDWARD AMES

THIS is the story of an everyday miracle that affects the lives of every one of us—the story of a miracle in glass. It is the story of how GLASS is made into a pure, soft, white fleece and—by another process—into threads of a silk so fine they would make even the silk worms envious. It is the story of glass that folds, that can be tied in a knot—yes, even as a necktie. Of draperies that do not fade or rot and that may live to be the heirlooms of future generations. Of tablecloths in which no careless cigarette can burn a hole. It is the story of glass that makes your kitchen range cook cooler. That helps out your gas and electric bills. That may make motoring more dependable by greatly increasing the life of your car's storage battery—and cure the sourness of your radio's reception. *Sound roar of planes' engines in take-off.* Glass—that muffles the heat and the roar of airplane motors. That helps make houses and buildings—railroad trains and airplane cabins—warmer in winter—cooler in summer. It is the story of glass thread so strong that had *it* held the sword of Damocles, the old tyrant would have had nothing to worry about. Fiberglas: That's what this material is called, because that's what it is—pure glass, formed into fine fibers. How is it done? Let's follow the process from start to finish. Fiberglas is made of glass and glass is made of selected sands, limestone and other minerals. Many carloads are daily unloaded into huge batch bins. The diagram explains this operation. Sand, for example, goes up the conveyor where you see the arrows going up, down into one of the bins, and from the bin, it is dropped little by little, as needed, into weighing hopper below. These accurate recording scales, one beneath each weighing hopper, are so precise they measure tons almost in ounces. The operator lets down the exact quantity of each ingredient into the hoppers—and then this collecting car, as it travels from bin to bin, gathers the various ingredients of the batch. The batch is thoroughly mixed by machinery. Dumped into another kind of conveyor, and elevated to the floor above where whole trains of them line up—awaiting their turn to go to the furnaces where the miracle of sand to glass and glass to fleece and silk begins. Refined molten glass is fed to this machine, and it emerges as glass marbles. That's right—just the kind that you like to play with. Except they're clear glass. Putting the glass into this form allows it to be inspected for imperfections. And that's what this fellow is doing. He looks carefully at each one, throwing out those with even the tiniest dirt specks in them. This is the bottom of an electric furnace. The inspected marbles we just saw are fed into it automatically and melted. The molten glass comes out like honey from the bottom of the furnace through more than a hundred tiny holes,—in filaments so fine that a single marble can be stretched out 97 miles. The filaments are gathered together into a single strand and pulled down—to the floor below where a high speed winder draws it at the rate of more than a mile a minute. Gossamer filaments of glass, soft as silk, so fine at least two strands are twisted together to form a thread suitable for weaving. And yet these fibers have a pull strength greater than steel. More than 6,000 miles of continuous filament yarns are turned out at this plant every hour—more than enough each day to girdle the earth five times. And from this point, the processing of glass thread and the weaving of glass cloth is much the same as if these filaments were the product of the silk worms of the Orient. Like the silk-worm, this first process makes a *continuous* filament. But there is yet another process for producing yarns that make a different kind of cloth of glass. Like the wool from the sheep—or like flax or cotton—the thread from this other process is made up of hundreds of individual fibers—so twisted that they cling to each other forming a fine yarn. Here again, marbles go into an electric furnace. The molten streams of glass are yanked by high pressure steam and hurled down from the furnace at such speed they cannot be seen—they strike a whirling drum in the foreground where they form a delicate web, which is gathered and wound at high speed—much like a soft knitting yarn—on a swiftly revolving take-up spool. At this point, the Fiberglas

*Presented at meeting, Piedmont Section, January 15, 1941.

textile plant takes up the work of twisting the thread—weaving some of it,—passing along much of it to the plants of other companies for fabrication. But—fabrication into what? Miles—millions of miles of glass thread! What's it all used for? Here is one answer: These two motors are attached to a demonstrating unit you may have seen at the World's Fair. The smaller motor on the left is insulated with Fiberglas—yet both motors have identically the same power output. The Fiberglas—insulated "Motor of Tomorrow" has the size of a five horsepower motor, yet it delivers ten horsepower—the same as the larger standard ten horsepower motor. Here's the same idea in practice. Both motors deliver exactly the same amount of power. But the smaller one at the left is insulated with Fiberglas. Motors that handle tough jobs are breaking endurance records when insulated with Fiberglas. Deep in a damp, hot coal mine, this loader stands up far longer than motors formerly used. Here in a steel mill, where hot sheets are quenched and coiled, Fiberglas insulated motors work in a bath of steam and heat—and keep on working! Fiberglas insulation won't burn. It withstands acids that would ruin metals. The individual fibers do not absorb moisture. They do not conduct electricity. They are strong, even at high temperatures. Thus Fiberglas makes a superior electrical insulation. Electrical insulations of all kinds and sizes are made of Fiberglas to rewind old motors, to repair burned out equipment and—for use in almost every conceivable type of modern electrical equipment. The smaller transformer on the right is more compact because it is insulated with Fiberglas. And here is another use in the electrical field—in storage batteries . . . glass in storage batteries? Yes, indeed—to give you greater motoring dependability—operate your radio and heater—start your car more faithfully—wafer thin porous mats of Fiberglas keep the power producing materials in place. And because of them your next new battery of this improved type, will doubtless serve you longer. Yes—the gowns the young ladies are wearing are of Fiberglas. This, however, is but a glance into the future because Fiberglas is not yet satisfactory for dresses or suits of any sort and none is sold for such uses. My lady's shoes—they, too, are of Fiberglas cloth. These Cinderella slippers may be found in the smartest shops today. Some of the leading stores offer a complete line of Fiberglas hats. They are known by that name—Fiberglas! There are neckties, too, and handbags of Fiberglas fabrics. Beautiful, shimmering material that does not fade or rot. Some stores use Fiberglas cloth as background for window dressing. It adds an atmosphere of luxury. Fiberglas lamp shades. They're absolutely fireproof, of course, and easy to clean. They are made in a wide variety of sizes—weaves—and patterns adaptable to any setting. Fiberglas shower curtains in delicate ecru, white or periwinkle blue, add a note of cheerfulness and luxury to the bathroom. The material isn't damaged by constant contact with the water, will never mildew. The ever-widening scope of Fiberglas fabrics includes many other items—among them bedspreads and draperies. Draperies that are sunfast, that do not have to be lined. Ask your decorator! Beautiful, shimmering, lustrous draperies. Expensive? Not extravagantly. They are priced with the better drapery fabrics. But they never rot—they shed dust—they cannot catch fire. Their lifetime? No one knows. Treated properly, perhaps they will serve your grandchildren. And tablecloths whose beauty excels the finest damask—are priced with the finest linens—but will not hold stains. That cigarettes won't burn or scorch. Fiberglas!—the versatile material that affects our everyday lives! So far, we have seen how Fiberglas thread and yarn are made. But that is only half the story now for Fiberglas wool. Remember how the selected sands, limestone and other minerals were made into glass marbles of crystal purity? Instead, the batch slides down a funnel to the "dog house" of the great melting tanks. It once was pushed into the furnace by hand—now automatic feeders take this hot job. At the other end of the melting tank—white hot molten glass streams down through narrow slits in a thousand slender jets. And here's the simple magic of it. At one end our batch can pour in minerals. At the other end, we see the streaming jets of molten glass. And then, hidden within the huge machine, the white hot glass is yanked and pulled by live steam—and on the floor below—we find this! Yes—believe it or not, fluffy, white fleece, true glass made soft and resilient! Day and night—week in and week out—these continuous blankets of man-made wool stream forth endlessly—mile after mile of them. But so much of it! What's it all used for? Where does it go? Let's follow it to its destination. Let's see for ourselves. Fiberglas leaves the plant in many different forms. This is one of them. In bulk form as you see it here, it is shipped out by the trainload to become an important part of many different products. Kitchen ranges, for example, like most popular ranges of today, the one you see here is having its oven completely encased in Fiberglas insulation—that helps keep the heat inside the oven—keep the cook cooler—save amazingly on fuel bills. Indeed, Fiberglas does such a good insulating job that it is used in well over half of all kitchen ranges made today. For the same reasons Fiberglas is used to insulate almost every good electric roaster. Until recent times, in millions of American homes, the hot water supply was a bone of contention. One good bath took all there was, and the washing—the dishes—and father's shave all had to wait. But that problem has been solved, and Fiberglas is no small factor in the solution. Fiberglas insulation helps keep heat snugly trapped within the modern water heater—to keep our ice cream cold and our bread warm—trucks delivering these items must be insulated against outside temperatures. These two trucks are among the thousands in which Fiberglas insulation has been used. And trailers. Have you ever wondered how people could live in them the year round? Here's the answer. Fiberglas insulation

protects against winter cold and summer heat alike. It is used in ships, too, because Fiberglas insulation cannot burn or rust or rot. You know how mariners for many years measured tides and ocean currents by tracing messages dropped overboard in glass bottles. To be washed ashore perhaps thousands of miles away. These bottles survive because glass is not destroyed by salt water—or by sun—or by biting cold. These qualities have elected Fiberglas marine service—the acid test for almost any material. Used in cabin and deck spaces it protects passengers and crew from the harshness of sea weather. In refrigerated spaces it helps preserve the cargo and save power. It resist moisture. It is fireproof, clean, easy to handle, economical to install. Through the constant pounding of the seas, it says in place. Its tendency is to expand, not to settle. And yet it's light. On one ship alone it saved more than one hundred and twenty tons deadweight over older, heavier materials. Those, then, are some of the uses of Fiberglas wool when it is shipped from the plant in this state. However, many of these rolls go to other parts of the plant to be further processed before shipment. For example, many find their way to one of the world's largest sewing machines. So big is this sewing machine that it once sewed a blanket of Fiberglas wool ten feet wide by five hundred feet long. Fiberglas blankets serve many purposes. Here, for instance, is a refrigerated freight car insulated to preserve foods in long transit. One huge blanket protects the entire roof. Two other blankets—each eight feed wide by sixty feet long are used in insulate the sides and ends of the car. Each blanket extends from the center door on one side clear around in one unbroken piece—to the center door on the other side. Each Fiberglas blanket is designed to suit the kind of job for which it is intended. They come in many standard forms—sewed onto paper, Fiberglas cloth, or in the form of metal-mesh blankets. These are made by sandwiching thick layers of Fiberglas wool between facings of wire mesh or metal lath. The blanket is compressed to a specified thickness. And while it is still compressed, the blanket is "quilted" by short lengths of wire passed through the wool and facings and attached on either side. Metal-mesh blankets are used to insulate boilers—from the kind in your basement to the huge units in great power houses. Here are two standard size Fiberglas metal mesh blankets, 2 feet by 8 feet, rigid, but light enough for one man to handle. They are often used to insulate tank cars. Or the piping and processing towers in oil refineries. In the form shown here the blanket is especially made for pipe insulation. Or the blankets may be wrapped about huge pipes or retorts to conserve valuable heat or to help control high temperature processes. They are usually covered with cement or metal for better appearance indoors and to keep out weather in exposed locations. Thus far we have followed the wool from only one of the conveyors on which Fiberglas wool is made. Now let us turn our attention to another. This conveyor takes its wool into a long treating chamber. Into one end as soft, fleecy wool. And out the other as a rigid product which may be cut with a knife, shaved, and trimmed. For large orders it is shaped according to specifications—is cut into proper lengths and comes off the end of the line as a finished piece. It is so easy to handle—so light. It saves time and labor costs on the assembly line. It won't slump. And so—Fiberglas insulated refrigerators add to their other advantages—low operating costs, fast cooling, excellent food preservation. Fiberglas doesn't settle when the door is slammed. Fiberglas in this rigid form can be had in almost any width or thickness. It is used for many insulating purposes. It is light in weight, inexpensive to ship, easy to apply. Note how the fibers knit together at the joints. Here is still another conveyor. This one is making house insulation. Its wool has already been treated to make it semi-rigid, and now sharp knives trim the edges and a center blade separates the stream of wool as an island separates a river. While the white wool flows above, heavy vapor-resisting paper below is inked with waterproof black asphalt. It then travels upward to the conveyor where it is joined with the wool. Another protective envelope of paper—this time of porous type—is placed atop the wool. The edges are joined together by the skilled automatic hands of an ingenious machine—and it comes off the production line in huge fast-rolling balls that are quickly dropped into large round cartons. Hidden within the walls and roof of your home, this Fiberglas building insulation adds to your comfort, helps cut fuel costs to the bone. The scientifically designed vapor barrier, always placed toward the inside of the house, shields the walls and attic from moisture generated indoors—the moisture that may cause condensation in unprotected walls. Here is yet another conveyor carrying fibers much thicker than the others we have seen . . . white, clear, glistening fibers. The product of this conveyor is cut in squares and four of them—two with coarse fibers and two with finer fibers—are matched together. The result—the dust stop air filter. The air drawn into air conditioning systems passes through filters like these before it is circulated. The tempered air must pass through this four-layer maze of fibers before it is released to be breathed by those in the building. And each fiber has been coated with a dust catching adhesive to which the dust clings like flies on fly-paper. So—after some weeks or months have passed, the outer fibers look something like this. And the filter, chock full of dust you *didn't* have to breathe, looks like those black ones. To remove dust from the air—to relieve hay fever—to guard health simply and inexpensively—the dust stop air filter has been installed in thousands of homes—in hotels, theatres, public and office buildings, large and small. Here, new dust stop filters are being installed in the air conditioning system atop a great hotel. And so—glass that strains air—to protect you and your children from unhealthful dust and dirt. To save the housewife untold dustings, cleanings,

washings. Everywhere throughout the Fiberglas plant products are checked and tested. This inspector, for example, examines each air filter by holding it in front of a bright light which reveals the slightest flaw. Every process of forming fibers is subject to precision control, watched by experts—ever vigilant—ever on the job. This man's job is to test the properties of insulating wool, to see that each batch meets high standards. Another inspector is using laboratory apparatus to find out how springy the wool is—how much "comeback" it has when pressed down. Are those textile fibers the right thickness to make good yarn and cloth? This fellow is constantly checking. Magnifying the fibers five thousand times. Project them on a screen. Measure them . . . Constant control to within one ten-thousandth of an inch on fibers—to within a fraction of an inch on the thickness of the wool blanket. Control everywhere—all over the plant. Nothing left to guesswork! Airplanes and automobiles—buses, ships and railroad trains lined with Fiberglas wool! Some of them equipped with Fiberglas curtains. The lives of their batteries lengthened because of Fiberglas mats. Refineries, manufacturing plants operating efficiently because of Fiberglas products. And power generated cheaply.

* * *

Mr. Booher: Mr. Ames in this talk has given you a little background of these products and I have brought with me the products themselves; first, the industrial Fiberglas wools composed of a jackstraw arrangement of fibers, ranging from four to five ten-thousandths of an inch in diameter and second the textile fibers averaging two ten-thousandths of an inch.

We speak of Fiberglas as being a "tough guy," and it is, because it's glass, completely inorganic and chemically stable. We have pointed out that Fiberglas is a hard worker industrially.

You have all seen the film and no doubt there are a lot of questions in your minds. I think I can best complete for you the story of glass by answering your questions. However, there is one thing I would like to leave with you, in view of your being textile men. Glass and textiles are two of the oldest known materials. How and where they first originated, no one is sure. Where the first piece of cloth was made, no one can say; where the first glass was formed, no one knows; but there are traces of both back to 2500 B.C. It is thought that the Phoenicians built a fire on the shores of the Red Sea, and there happened to be a high-content silica sand on that beach, and soda also was present. They made camp and built a fire, and with the silica sand and soda ash, and sufficient heat, when the fire went out there were globules of glass on the beach. That, we think, was the beginning, but we are not sure. There is no glass chemist or no glass technologist that can tell you what happens when these mineral oxides and silica are fused into a crystal that is so much a part of your life. Visualize a world without glass. Like cotton itself, it is a material we don't appreciate. We use it so much, it is so commonplace, like our clothes, we just accept it. It is even more true of glass. Science, transportation, almost everything, would be vitally affected by a world without glass. Therefore, we feel it is the servant of man, a necessary servant.

DISCUSSION

Member: How do you control the diameter of the fiber?

Mr. Booher: The diameter of the fiber is controlled by the viscosity of the batch and the speed at which the fibers are drawn. Operating at a certain temperature, say 2400° F. A furnace is controlled within 50° of that temperature. That gives a certain drag to the glass. I think in physics laboratories you have tried this or done it. Take a glass rod, put it in a Bunsen burner and draw it, the hotter and softer it is, the faster you can draw it. That is the theory of Fiberglas. You maintain the molten mass at a certain temperature and take way from that mass of glass, droplets that drop through very tiny orifices at a given rate of speed.

Member: The variation isn't very great then?

Mr. Booher: We don't have to worry about the variation of temperature. It's about sixty feet to the doghouse on a furnace. We load that furnace at such a distance from the forehearth where the fiber is formed that the cold batch has no effect on the temperature at the fore-hearth.

Mr. Sandridge: Can it be produced in colors, and at what stage of it would you color it?

Mr. Booher: We have to color it by applying mineral oxide or metal oxide. We have a problem with which you are no doubt familiar in coloring glass. You must use metal oxides in the raw batch and fuse them at the time you form the batch. They must be metals that will withstand the temperatures through which we run the glass. Our problem in Fiberglas is briefly this: We don't have sufficient body of fiber to retain density of color. Take, for example, a bottle of beer. The beer itself is amber; the bubble is white or tan. There isn't in the body of the bubble sufficient density to retain the amber color of the beer. When forming fibers two ten-thousandths of an inch in diameter, we can start with coal black glass and produce a dirty gray. This marble colored with cobalt seems coal black, and this periwinkle blue is the greatest intensity of blue we are able to draw. In the textile industry you have overcome every type of fiber and its dyeing and coloring, and some of you men sitting in here may overcome our problem of surface coloring the fibers of glass. It is going to be printed and piece-dyed or skein-dyed the same way you do your rayons today. And that is the economical way we can give you colors in Fiberglas.

Glass fibers can be used with other materials in hats, and neckties—I have on a tie with glass fibers in it. The thing glass fiber adds to the tie is a wrinkle-proof quality.

The United States Testing Laboratories tells us that for a dollar tie, we have one of the better ties on the market. You see, those fibers of glass give the silk body, give it a little more tensile strength. No matter how tight you tie it, when you hang the tie up overnight all wrinkles fall out.

Member: What can glass do to cotton?

Mr. Booher: Glass doesn't offer much competition to cotton. We will in the electrical industry have a slight effect, in that you can reduce the size of a class A insulated motor by the use of Fiberglas. You saw in the film a picture of two ten-horsepower motors, one insulated with cotton and one Fiberglas. Where we can save floor space by decreasing motor size or increasing motor capacity, Fiberglas can do a job and I don't think we can predict at this time how much effect it will have on cotton. On asbestos, we can do a lot because we can give you better insulated, smaller motors that operate on the same power. Cotton has nothing to worry about. You can't make sheetings or pillowcases or cloth from glass; we can't compete with your cloth.

Mr. McCarty: Is Fiberglas a trademark for what we have always known as spun glass?

Mr. Booher: Yes. The Corning Glass Works, in 1935 put out a story, before they started making present types, about "gossamer filaments of spun glass." It was taken up by the press, and we have never lived it down. There isn't any such thing as spun glass. Our glass fibers are formed on both stable and continuous types of machines without any twist whatever. We do draft our fibers. It's very easy to draft on standard equipment. This yarn can be drafted and the fibers drawn out in different lengths. You can reduce the diameter the same as in any other yarn. Those filaments you could class as being spun, but it's not like rayon. It has more tensile strength than any other fiber. It doesn't have a snap break in sliver form but it does have strength. We don't put twist in our original filaments to handle them.

Mr. Church: Are there characteristics of brittleness in this glass fiber or thread or yarn, whatever it is, that you have to contend with?

Mr. Booher: No, we have no brittleness problem, simply because we draw the filaments so fine they don't have sufficient rigidity to be brittle as you think of brittleness. The diameter of the fiber governs what can be done with the finished product and over what radius you can bend individual fibers. We make what we call a glass cotton for filtration. The filaments are less than one ten-thousandth of an inch in diameter and the individual filaments can be tied in knots.

Mr. Smith: In relation to a combination of Fiberglas and silk or Fiberglas and cotton, in connection with the mechanical operation in finishing, what would be the result of such a combination?

Mr. Booher: You want to know what would happen if you combine cotton and Fiberglas, will it stretch and will it shrink?

Mr. Smith: That's right.

Mr. Booher: The cotton will stretch; the Fiberglas won't give an inch. Anytime you combine Fiberglas with any other yarn you should use a pre-shrunk yarn, a yarn drawn to its minimum length; otherwise, the first time you wash it, it will shrink and the Fiberglas will then be longer than the cotton yarn. Fiberglas, in combination with cotton and asbestos and silk, can add strength, can add heat resistance. It can add only if properly combined.

Mr. Souther: Are there any other suggested uses for Fiberglas in textile processes than those mentioned in the film?

Mr. Booher: Electrical insulation and chemical filtration are the two big outlets for our present products.

Mr. Souther: Any uses in connection with textile dyeing?

Mr. Booher: There is this interesting thing in dye houses where you have the problem of lead-in cloths deteriorating. You can leave Fiberglas lead-in cloths in drying towers and they will hold up indefinitely, outlast the ordinary duck used for lead-in cloth. They will also resist the acidity of the dye.

Mr. Souther: It will stand the wear and tear?

Mr. Booher: Yes. Textileather Corporation in Toledo have an interesting process. They use Fiberglas cloth in all their treating towers. They tried them, I think, in a heat of about 350°. They use Fiberglas cloth and don't have to turn those dryers down at any time. They can run it back through, because 350° doesn't mean anything to Fiberglas.

Member: Has this Fiberglas been successfully used by itself or with other fabrics in knit fabrics?

Mr. Booher: No, and I can't answer just why. It seems, though, that the abrasive action of the knitting needle causes the glass yarn to break up. It will be knit some day because by treating yarns we are able to overcome abrasion problems.

Member: I've never seen Fiberglas before. Is it used around here?

Mr. Booker: It is not at all amazing that you have not seen Fiberglas. In 90 per cent of the applications of Fiberglas it is hidden in the walls of your home, range, refrigerator, or in the hull of ships and aeroplanes, and in the coils of motors. Fiberglas is a silent worker and truly a servant of man.

Why RESIN FINISHES Are Growing in Importance*

ALDEN D. NUTE
Calco Chemical Division, American Cyanamid Co.

RESIN finishes for textiles are no longer just "interesting." They have become an important phase of the industry. How important they have become is shown by their regular use by many of the leading textile finishers. The attitude of these progressive finishers to the developers of resins can perhaps be best be summed up in these words: "You have given us several very useful and remarkable finishes. These we have adopted and are enthusiastically promoting. Others of your developments show promise. We will want to know about them as they are perfected."

To an extent, as all of you know, synthetic finishing materials have followed the development of plastics. Having been active in both fields since 1929, we know how swift have been the changes. Not only has the growth of the use of plastics been phenomenal but changes within the field itself have, at times, been what might be termed revolutionary. Stability in plastics hasn't been reached yet, for dramatic as some of the plastic applications have been in the past, such promised developments as the all-plastics airplane of the future, are almost breathtaking. An outstanding characteristic of the growth of the use of plastics has been the speed with which new developments have completely supplanted older methods, even older plastics. For example, within two years, cellulose acetate entirely replaced polyvinyl butyrol in the safety glass field. Shifts, developments, changes—all these happen with amazing regularity in the plastics field. These kaleidoscopic changes have been pushed through in the name of greater consumer appeal. Bitter competition during the thrifty thirties led merchandisers to seize upon the flexibility, brilliant color and economy offered by the use of plastics to producers and packagers of innumerable items.

This same economic stimulus—the need to put a commodity with an always greater sales appeal on the market—is squarely behind the present increased demand for synthetic resin finishes. These resins accomplish two fundamental objectives, both of which can mean greater sales. The first of these is to vastly improve certain textiles in such ways as back filling and an improved "hand." The second, in effect, produces an entirely new textile. For no one can say that a fabric made permanently crease-resistant is not to all practical purposes an entirely new article.

The synthetic finishing resins are chemically identical to those used in the plastics field. The same urea formaldehyde produces Beetleware dishes and the Aerotex Cream No. 450 which gives one the desirable crease-proofing for rayons. Developments in the plastics field have had repercussions in the finishing field. Melamine, for example, introduced recently by Cyanamid, is an outstanding development as a base for plastics and is showing unusual promise in the textile finishing field as well. Most of the other synthetic compounds of this character also are important to both the plastics and textile finishing applications. The one exception seems to be that of the phenolics, where a color objection limits their usefulness as finishing compounds. But urea, the alkyd compounds the acrylates and the vinyls have all proved important in both fields.

As has been mentioned already, consumer opinion and demand for something better is playing an important part in the growth of the use of resins for fabric finishes. Gay, smart-looking, yet economical packages, gadgets and trinkets have been made possible by plastics. The buying public has preferred these to the more customary articles and expressed that preference in actual purchases.

What has happened in the case of plastics has been seen in the field of textiles as well. Take for example the fastness qualities of dyestuffs. Dye makers have been forced to continually improve these fastness specifications. There was a time when cheap textiles were not expected to have colors that withstood rigid tests of light, sea water, laundering or other fastness requirements. That is no longer so. Mrs. American Housewife today expects that the cheap cotton housedress that she buys for $2.98 won't run or fade too quickly. In the past season, we have seen that a tremendous consumer pressure has forced the makers of spun rayon fabrics used for inexpensive sports clothes to use fast dyes. Over the past twenty-five years, perhaps the most outstanding single development in the field of dyes has been the production and development of more of the inexpensive dyes which meet these fastness requirements. Consumer preference has forced this fundamental change.

But color fastness is only one, though perhaps the first to be felt, of the several great changes in the textile industry that have been brought about by consumer preference. The second of these changes is the control of shrinkage. Progress in this direction has been phenomenal. Where it was once expected that cheap cotton fabrics

*Presented at meeting, Piedmont Section, April 19, 1941.

such as low-cost shirtings would shrink by a sizeable per cent, consumers will now emit vociferous squawks if these cheap cottons shrink after several launderings. Today many reputable merchants refuse to carry in stock any articles that have not been pre-shrunk by one process or another. Consumer pressure in this case has succeeded in forcing another fundamental change in the character of salable textiles.

The third great trend in the textile finishing field is just getting under way. Some momentum has already been felt. Many consumers are demanding permanent finishes on cottons and rayons. The marketing possibilities of an inexpensive cotton or rayon fabric that offers the feel, the drape and the hand of silks and wools are obviously tremendous. They are immeasurably greater, though, if that improved finish can be applied so that it will last the life of the article.

From a number of trades come indications of the upsurging nature of the popular demand for improved finishes. In the sheeting trade, for example, a survey was made two years ago covering retail outlets all over the nation. Merchants were asked whether they believed special finishes were important in this type of goods. Three out of four answered "Yes." Another survey in this same field showed that in 1936 retail merchants were only slightly interested in special finishes. By 1939, a comparative survey revealed that special finishes ranked as an important factor in their choice of a line of sheeting.

In the case of various spun rayon fabrics this trend is even more pronounced. In an August, 1940, survey in the men's wear trades a nationwide survey of retailers showed a tremendous interest in both the special finishes and shrink-proofing. Two out of three wash suits sold in 1940, for example, were pre-shrunk. In 1939, the figure was but one out of two. These retailers estimated that in 1941, three out of four wash suits sold, would be pre-shrunk. With reference to sport ensembles, these retailers said that almost one-half the cotton, linen and rayon ensembles were of crush-resistant fabrics in 1940 as compared to one-third in 1939. An increase was expected for 1941. In the case of sport trousers, however, the demand for crease resistance was revealed as overwhelmingly on the upswing. In 1939, 29.8 per cent of the trousers sold were crease resistant. In 1940, the figure was 39.3 per cent and the estimate for 1941 was 50 per cent. This represents a demand for crease resistance that nearly doubles itself in two seasons. In the face of figures such as these there can be no doubt of the demand for the finishes imparted to textiles only by these new synthetic resins.

At the present time, urea formaldehyde resins are, in general, the most widely used. This is due to a number of reasons. One is the clear, transparent nature of these products. Another is the ease and economy of their application and a third is the permanency of the effects produced.

These urea formaldehyde resins are produced and marketed as three distinct types.

The first type is a low polymer, either in paste or powder form, which is particularly suitable for use in crease-proofing and shrinkage control of spun rayons and cottons as well as in the crush-proofing of velvets. When a water solution of such a resin is applied to a fabric, the resin enters into the fiber and upon the application of sufficient heat polymerizes within the fiber and becomes insoluble.

The second type is a higher polymer, either a liquid or a syrup. Resin products of this type are used for fiber stabilization, permanently-glazed chintz and pure finishes where a full hand and permanency are desirable. In contrast with the first type, when a water solution is applied to a fabric, the resin tends to remain on the outside of the fibers, and upon heat treatment, forms a clear, transparent coating.

Type three is made up of a series of emulsions. These are prepared, in general, from water-immiscible resins in solvent solution by the use of special emulsifying agents. Such water dispersions find extensive use in the pure finishing of cottons and spun rayons.

When applied on the fiber, various effects are accomplished. One of these is the cementing of a back filling on cotton. Here is a sample, for example, of a low-count cotton, 64 x 60 shirting to be exact. The clay filler has been cemented in place more permanently because of the resin binder. When this sample is torn, the falling out of the clay, or dusting, just doesn't happen.

In the case of rayons, non-slip finishes are coming in for an increasingly important consideration. Here again, the resin is applied *on* the fabric rather than *in* it. Non-slip finishes applied to low-count rayon satin weaves, for example, have greatly increased the marketability of the textile.

Spun rayons, while not what might be called new fabrics, have still been presented in constantly novel weaves. Each season has seen the introduction of many fabrics from this material that have added variety of texture, color and pattern to drapes, dresses and other articles. One problem in developing these novel fabrics is that of setting the weave. For this job again, resins have been called upon to fill the bill. The stabilizing effect that their application has brought about has been one factor in the popularity and strong consumer acceptance of these spun rayon creations.

It has also been found that the tensile strength of cottons tends to increase upon the application of certain synthetic resins on the fiber. All of the applications so far mentioned deal with effects obtained by applying the resins on the fiber rather than in the fiber.

Such standard equipment as pad mangles or quetsches are sufficient for the application of resins. Frequently, an application of as low as 1 per cent is sufficient to produce the effect desired—at other times 10-20 per cent is necessary to bring about the desired finish. The procedure

is usually to pass the fabric, while dry, through a pad mangle filled with the resin bath, then to dry on a tenter frame. This may or may not be followed by hot or cold calendering.

Several other applications of resins on the fabric have been developed that may be interesting to note. The glazed finish for chintzes is one and the use of resins for this purpose has resulted in a vastly more permanent effect. Back sizings for rugs, carpets and other pile fabrics are others. Then in the hat trade, resins are now being used, to some extent, as a substitute for shellac.

It has been in the field of anti-crease finishes, though, that synthetic resins have accomplished their most valuable results. For applications of this nature, the resin is absorbed into the individual fibers themselves, and ordinarily practically all of the resin on, or between, the fibers is removed by a subsequent washing operation.

Crush-resistant velvet with rayon pile is one of the most dramatic illustrations of this use of resins. Transparent velvet produced in this manner has come in for a new popularity in the dress trade because of its greater wearability and consumer appeal. Study of this crush-resistant effect proves that fibers become more elastic and more resilient from this treatment. The result, at any rate, is to render fabrics of cotton and rayon, in particular, more wearable, serviceable and marketable.

Spun rayon fabrics are being made crease-resistant by a similar application of resins. Because of the increased significance recently of resins, this development is beginning to have far-reaching effects. Mixtures of spun rayon with wool, with acetate or with cotton are being marketed with increasing success and profit. Resins are an important factor in opening up this new market for, to a great extent, the qualities they add to the finished article help to make the fabric a remarkably salable product. Crease-resistance, through a resin treatment, has also been adopted by the linen trade.

We have already noted that the resin emulsions placed on the market are designed primarily to add an improved "hand" to yard goods. A softer, firmer feel that ordinarily goes with very fine fabrics can be imparted to cotton and rayons with these finishes. A luxurious drape can add a new sales appeal to these fabircs.

Very important, in connection with the use of these emulsified resins, is the practice of many mills to use several resins on one fabric. For example, the same piece of spun rayon can be crease-proofed and treated for a better hand. Through such means as these a greater control over the character of the finished product can be maintained. The application of multiple finishes is not considered uneconomical for it is possible to combine two types of resins in the same bath.

A vitally important feature of these resin finishes is their permanence. Tests conducted by the American Institute of Laundering show that many of these finishes have excellent resistance to laundering. Aerotex Cream No. 450, for example, will retain 80 per cent of its finish after more than ten launderings. Further tests have demonstrated that these finishes also withstand repeated dry cleanings.

In concluding this talk, there are several related points that might be made. One of these is the price range of the synthetic resins. Taken over a period of time textile resin prices have steadily declined as increased production and manufacturing efficiencies permitted such revisions. This curve contrasts rather vividly with the fluctuations that some of the natural products have performed during the last year or so of war. For a number of months now, no prices have been quoted on locust bean gum, one of the more important of the natural gums.

This situation, naturally, has been caused by the war in the Mediterranean which has quite effectively prevented adequate importations. Again, here is an advantage for the synthetic product for it is produced as regularly as turning valves.

We have found that just as in the case of the natural products, where no one individual starch or gum will produce every desired finish, it is likewise true that no one resin has the same power to perform all the miracles which the finisher wishes. However, by a judicious combining of various resins, it is now possible to obtain, at a reasonable cost practically any type of finish that the mill man requests.

From time to time, I have made notations, listing those properties which a perfect creaseproofing or shrinkage control resin should have. These are listed as follows:

1. The resin should rave excellent stability to storage.
2. It must have high solubility in cold or warm water.
3. It must not cause dermatitis.
4. It must not affect light fastness of colors adversely.
5. It must not affect tensile strength adversely.
6. It must not affect abrasion resistance adversely.
7. It must not retain chlorine from laundry chlorine bleach liquors.
8. Color shades either printed or dyed should remain practically unaffected.
9. It should cure within a reasonable time interval at 220°-250° F.
10. It must have good permanency to laundering, retaining "hand" as well as resin content.
11. It must not leave any disagreeable odor in the finished goods, even though a washing operation is omitted.

To be sure, such a resin to be the perfect product which you all wish should be priced at such a figure as to enable the finisher to cut his finishing costs in half.

While it is true that we have not yet produced one resin that combines all of these properties, our efforts have already indicated that the preparation of such a product may not be impossible.

In closing this paper, I might quote the French proverb: "De savoir avant avoir," which could be interpreted as "to know is to have." As we learn and understand the many finishing problems of the mill man, we will exert our every effort to produce those resins which will meet his every requirement.

National Defense—

(Concluded from page P409)

be wasted on an army of cowards. I do say, however, that the bravest soldiers, under the most brilliant leadership, can win no battles against an enemy of average personnel whose material is vastly superior. The arsenal of the victor must run at top speed, and it will not do so unless each one of us engaged in the productive effort gives all he has to his job.

A diminishing number of business men still appear to regard this war (which we are in or out of as you may look at it) as an opportunity to make more money than they ever made before. Can America arm with such attitude? Hitler says we can't: That the decadent plutocracies are so corrupted by sloth, selfishness, greed and dissension, that they are incapable of any effective war effort. My opinion is that the American system of private enterprise can outstrip Hitler's system of forced and regimented economy if American business will unite in keeping the motive of private profit secondary to that of National Defense. I hold no brief against reasonable profits. Without the taxes arising from substantial and widespread profits the enormous government purchases of munitions could never be paid for. But can we not be satisfied with profits that we would have considered handsome under normal conditions? Can the economic structure stand an ascending spiral or runaway prices started by heavy government buying and encouraged by speculation? Even if the war effort should survive such conditions, peace would bring disaster.

Last but by no means least, we can handle the relations between labor and management in such a way as to maintain the uninterrupted flow of vital munitions through our industrial plants. The loss of every man-hour of production in defense industries may mean the loss of one or more American lives. The loss of any considerable proportion of our total productive capacity will certainly cause our whole armament program to bog down. If we cannot arm, we will be vanquished. If we are vanquished we will be slaves. The vast majority of men in the management of American industry have come from the ranks of labor; there is no laborer, however obscure and insignificant, who has not the opportunity to raise himself by his own efforts to the highest post in American industry. There are no locked doors here that need to be battered down; they stand open to welcome every man whose skill, loyalty and energy can make him more valuable to the success of the enterprise. In the army of Napoleon it was said that there was a marshall's baton in every knapsack; in the army of American industry there is the key to a private office in every dinner-pail. Who is the No. 1 man of American industry? Bill Knudsen, as everybody knows. How did he get there? By the same path that is open to every poor boy in the land who is ambitious and persevering.

Cannot these men, all American and all with a common stake in the future of our country, get together on reasonable wages and working conditions without keeping Uncle Sam waiting for the things he needs so badly while they squabble? Does Labor, organized or unorganized, want to use the national peril as a lever to secure organizational or other gains they were unable to obtain in normal times?

Take a look at France, my friends. Study her history during the past few critical years, and draw your own lessons from the fate of the country that allows itself to fall into the hands of the political demagog, the business profiteer and the labor racketeer! Shall we allow the same fatal diseases to sap our strength? From sea to sea, from mountain, plain and valley, swells a thunderous NO! If we cannot heal our sores we will cut them out. If we are strong and healthy within we need fear no dangers from without!

MEETING, NEW YORK SECTION

A MEETING of the New York Section was held on May 23rd, 1941, at the Swiss Chalet, Rochelle Park, N. J. J. O. Amstuz, Chief Engineer, Behr-Manning Corp., Troy, N. Y., spoke on "Electrocoated Fabrics." This paper was highly appreciated by the audience.

Henry F. Herrmann, chairman of the nominating committee for officers of the New York Section, proposed the following names for officers for the coming year: chairman—Harry R. Tisdale; vice-chairman—Patrick J. Kennedy; secretary—Norman A. Johnson; treasurer—Edward H. Schmidt; councilors for 1942—J. E. Meili, Harold W. Stiegler, George A. Moran and J. R. Bonnar. They were elected unanimously.

The new chairman appointed a sectional committee consisting of Henry F. Herrmann, Ephraim Freedman and George L. Baxter.

It was indicated at this meeting that we should anticipate a large and successful outing on June 20th at the North Jersey Country Club.

The secretary was authorized to convey to the family of George R. Pensel the deep sympathy of the members of this section on his recent death. The members stood in silence for one minute in respect to his memory.

The chairman again called attention to the national convention which is to be held in Pinehurst, N. C., on October 31st and November 1st.

Total attendance—90.

Respectfully submitted,

P. J. KENNEDY, *Secretary.*

TRADE NOTES • NEW PRODUCTS

• COURSE IN CHEMICAL ANALYSIS

An intensive course in applied chemical analysis, designed to give competency in laboratory practice connected with national defense, will start on August 4, at the Polytechnic Institute of Brooklyn, Professor Raymond E. Kirk, Institutional representative for engineering defense training courses, has announced.

Sponsored by the U. S. Office of Education, the course will be given in both day and evening classes, without cost, to qualified applicants who have successfully completed at least two years of college chemistry, including one term of quantitative chemical analysis.

Application blanks and detailed information may be obtained from the Registrar, Polytechnic Institute of Brooklyn, 85 Livingston Street, Brooklyn, N. Y.

• COLOTEX B

The Chemical Research Laboratories, 316 East 102nd Street, New York, N. Y., has developed Colotex B, a universal textile indicator, which was put on the market May 1. Colotex B is manufactured by the General Chemical Manufacturing Company of the same address, and is distributed by the Neuberg Chemical Corporation, 441 Lexington Avenue, New York.

For further information, a color chart and instructions are included with each order for Colotex B.

• JOINS SHERMAN CO.

J. W. Stewart, formerly of General Dyestuff Corporation, has accepted a position as the New England representative of the George E. Sherman Co., Inc. Mr. Stewart, a graduate of Lowell Textile Institute, has served as a demonstrator for General Dyestuff Corporation for the past eleven years and will handle a line of textile oils, soaps, detergents, finishes, wetting agents, softeners, etc.

• SOLVAY DEVELOPMENT SECTION

The Solvay Process Company, manufacturer of alkalies and nitrogen products, has recently established a separate Product Development Section with W. E. Blair, Manager and D. H. Ross, Assistant Manager. Headquarters of the new section will be at 40 Rector Street, New York City. Messrs. Blair and Ross, formerly associated wtih the executive office of Solvay Sales Corporation, will apply their knowledge of the chemical industry principally to a study of the commercial usefulness of new Solvay products. Their work will involve close cooperation with the research and technical sales groups, with view to broadening the scope of Solvay's service to its customers.

• GRADUATES IN SERVICE

Dr. Thomas Nelson said recently twenty-five of the forty-eight graduates from the Textile School of North Carolina State College in June have accepted commissions in the Officers Reserve Corps, and practically all of them are now in the service. Because of their special training a large percentage of them have been assigned to the Quartermaster Corps and ordered to the Quartermaster Depot at Philadelphia.

Quite a few textile graduates of former years who held commissions in the Reserve Corps are now in the service and others are working as inspectors in the Quartermaster Corps where a knowledge of fabrics is essential.

• QUARTERLY PRICE LIST

The July, 1941, number of the *Quarterly Price List,* publication of the R & H Chemicals Dept., E. I. du Pont de Nemours & Co., Inc., Wilmington, Del., has recently been issued. Copies are available upon request.

• GENERAL RELEASES

General Dyestuff Corp., 435 Hudson Street, New York, N. Y., has recently distributed circulars describing the following products:—

Katigen Deep Black RND Extra Conc. CF and *Katigen Deep Black RRND Conc. New CF*—representing non-dusting forms of the two important red shades of General's sulfur black line. They are said to be well suited for the dyeing of cotton and rayon in all stages of manufacture. They produce full reddish blacks said to be of very good fastness to cross-dyeing, perspiration, washing and light. Both products are adapted for machine dyeing and can be used on material which is to be rubberized after dyeing. Circular G-264.

Prestabit Oil C—a stable sulfonated oil which is of value as a penetrating and lubricating agent in many dyeing and finishing operations. It is stated that it fills the gap between the usual low sulfonated castor oils and Prestabit Oil V New. It is said to combine good stability to lime and magnesium salts with excellent stability to alkalies and to both inorganic and organic acids. Circular G-269.

Diamine Bronze Brown PEN—a direct dyestuff suitable for dyeing vegetable fibers in their various forms. On mixed fabrics of cotton and rayon, it produces dyeings of excellent tone-in-tone effect. The product is also well suited for dyeing cotton-wool unions, the relative depth of the two fibers being readily controlled by the dyeing temperature. Circular G-282.

Diazo Brilliant Orange GRN Extra—which produces, when diazotized and developed with Developer AMS, exceptionally bright, reddish shades of orange said to possess fairly good fastness to washing. With Developer ZA, it produces bright shades of golden orange of similar properties. It is suitable for dyeing the various forms of cotton or rayon. It can be discharged to a good white with Rongalite C. Circular G-281.

• CHARLOTTE HEADQUARTERS, A. C. & C. CORP. AND CALCO

A few weeks ago, a new building in Charlotte, N. C., was occupied jointly by the Calco Chemical Division, and the American Cyanamid & Chemical Corporation. This new air-conditioned structure, especially designed for the needs of these two chemical organizations, houses the offices, laboratories and warehouses. In all, the building provides 8,600 square feet of space. An interesting feature of the air-conditioning system is the separation of the laboratory system from that of the office. This prevents circulation of laboratory odors to the other portions of the building.

The address of these new quarters is 3333 Wilkinson Boulevard. American Cyanamid & Chemical before this move had been located for a number of years at 822 West Morehead Street, also in Charlotte. Calco's former Charlotte address was 1112 South Boulevard.

American Cyanamid & Chemical Corp.

The American Cyanamid & Chemical Corporation centers its entire Southern dis-

Top—View of Textile Laboratory in new A. C. & C. Corp. and Calco Building at Charlotte.
Below—Exterior View of Building.

trict sales activities in this new office. This company manufactures chemicals for the South's paper industry, the Southern textile industries and a number of other important businesses located in the South.

This new office building, located adjacent to the American Cyanamid & Chemical Corporation's Charlotte plant, provides closer coordination between the activities of plant and office. The Charlotte plant is only one of seven Cyanamid Chemical plants located in six Southern states. In addition, the company mines bauxite in Georgia and Arkansas.

"The growing industrial health of the South," according to Hugh Puckett, Cyanamid's Southern Sales Manager, "is an important phase of the economic development of the entire country. Cyanamid, by locating plants and facilities near our Southern market, not only is able to provide faster service, but is cooperating in a long-term effort to build a better balanced industrial structure for Southern industry."

The American Cyanamid & Chemical Corporation, being formed primarily by the merger of The Kalbfleisch Corporation and A. Klipstein & Company, is one of the oldest chemical companies in the South. A. Klipstein & Company opened its office in Charlotte roughly a half century ago; and it was a quarter of a century ago that The Klabfleisch Corporation established a plant in Chattanooga, Tennessee This latter firm is more than 150 years old. Among the Cyanamid chemicals used by Southern industry are sulfonated oils, softeners, penetrants, sizing compounds, wetting agents, and sulfate of alumina.

Calco Chemical Division

The laboratories, which Calco will now be using in this new building, are illuminated entirely by daylight fluorescent lighting. The equipment in these laboratories is designed to provide the most efficient kind of service to the textile mills in the South. According to J. E. Moore, Calco's Southern Sales Manager, "Cotton and rayon dyeing is an important phase of the Southern textile industry and the manufacture of dyestuffs and the servicing of the needs of dyers is vital to this activity. The equipment in these new laboratories duplicates the most modern type of dyeing machinery."

With the apparatus in these new laboratories, it is possible to dye yarn, piece goods or raw stock. Shade matching and the testing of formulations will be more quickly accomplished with this latest type apparatus. These laboratories are fully equipped to conduct all of the various fastness tests.

The blending equipment to be found in this new building is as modern and efficient as can be provided. Many special sizes of blenders have been provided so that orders for various quantities can be handled with exceptional speed.

Photo by Franz Schneider

The new building which houses the Federal Archives at Schwyz in Central Switzerland.

● SWITZERLAND'S 650th ANNIVERSARY

On August 1st the Swiss Confederation celebrated the 650th anniversary of its founding. In view of prevailing world conditions this program was necessarily devoid of any ostentatious displays.

On August 1st, 1291, the three tiny mountain states of Uri, Schwyz and Unterwalden formed their Perpetual Pact to safeguard a system of local self-government in opposition to the officials set up by the Habsburgs. Lucerne, also a Habsburg possession, joined the democracy in 1332; the imperial town of Zurich joined in 1351, followed a year later by Glarus which was retaken by Austria in 1355 and reunited with the Cantons in 1388. Zug became a part of the union in 1352 and the imperial town of Berne in 1353. One after the other the towns and districts joined until, in 1815, Switzerland's union of 22 cantons was complete. In November of that year the Peace of Paris guaranteed Switzerland her perpetual neutrality.

In 1874 the Federal Constitution was revised with a tendency toward further centralization, the cantons still enjoying the greatest degree of independence but the Confederation taking over the handling of foreign affairs, national defense, coinage, railways, postal service and, partly, justice.

Switzerland has 4,068,000 inhabitants of which 2,900,000 speak German, 830,000 French, 242,000 Italian and 44,000 Romansch and accordingly the nation has four official languages.

In order to safeguard her neutrality the Republic has been a staunch advocate of military preparedness. Developments since September, 1939, have shown that Switzerland, with her militia army of five to six hundred thousands, was prepared. Since June, 1940, the mobilized forces have been kept down to 250,000 men.

The official Swiss anniversary celebration took place at Schwyz and on the Rütli. Schwyz, according to historians, was the leader among the founders of the Confederation. The Federal Archives, shown in the illustration, contains Switzerland's most sacred documents, including the priceless original deed of Confederation between the three pioneer cantons. The Rütli was the meeting place of the fathers of the Swiss republic.

As August 1st was a Federal holiday in Switzerland the program of commemoration lasted all day and was observed in every hamlet, village and town. A memorial coin in the form of a new 5-franc piece was struck for the anniversary.

The Swiss-born international Red Cross at Geneva has long served to alleviate the sufferings of countless war victims. So overwhelming are the demands on the International Red Cross now that a staff of 3,000 persons, of which all but 200 are volunteers, is working at Geneva, while an overflow of duties has been assumed by 1,800 volunteers in twenty Swiss towns. The Red Cross acknowledged its debt to Switzerland by using for its insignia the reverse of the Swiss flag.

To commemorate the anniversary, all of the offices of the Sandoz Chemical Works, Inc., and Ciba Company, Inc., were closed on Friday, August 1st.

● CALCOFAST WOOL YELLOW N

The first of a new series of metallized dyes is currently being announced by the Calco Chemical Division, American Cyanamid Company. According to an announcement folder Calcofast Wool Yellow N, the name of this new dye, offers exceptionally good fastness properties to light and wet processing. It is claimed that this new Calco development has a combination of fastness properties not common to acid yellows but more like those of the chrome yellows.

Because of these fastness properties, Calcofast Wool Yellow N is recommended by Calco for carpet yarns, men's and ladies' wear, upholstery yarns, bathing suit and sweater yarns.

For the dyeing of woolen material, composed of mixed stock, it is stated that Calcofast Wool Yellow N produces much more uniform shade effects than the commonly used unmetallized type of dyes.

Metallized dyes are recommended by Calco for use on unneutralized carbonized stock and furthermore, the effect of carbonizing stains is eliminated to a great extent by their use.

Copies of Calco's folder, announcing this new dye and containing complete property tables, swatches and dyeing methods, can be obtained from Calco at Bound Brook, New Jersey.

•TECHNICAL NOTES FROM FOREIGN SOURCES•

Moisture Content and Regain of Textile Materials

In an article reproduced from the Journal of the Textile Institute (1940, 31, S3-S4), the Journal of the Society of Dyers and Colourists (56, Oct., 1940) prints in its Scientific and Industrial Notes section a series of definitions and examples dealing with atmospheric humidity, moisture content and regain of textile materials, from which the following is taken:

The amount of moisture in a material when expressed as a percentage of the total weight is termed the percentage moisture content.

When the moisture present in a textile material is calculated as a percentage on the oven-dry weight, the percentage is termed the regain.

(Thus, if 100 parts by weight of material contain 20 parts by weight of water the moisture content is 20 per cent and the regain is 100 x 20 ÷ 80, i.e., 25 per cent.)

Standard regains are arbitrary values chosen as the most useful for commercial purposes. The correct conditioned or "correct invoice weight" of a consignment shall be calculated from its oven-dry weight and the recognized standard regain.

The various textile fibers, and the yarns and cloth made therefrom, have more or less arbitrary percentage moisture contents and regains accredited to them, so that for trade purposes they may be declared "in correct condition" when they contain the recognized percentages of moisture or the equivalent "regain." The following "standards of regain" have been proposed and are commonly, but not universally, accepted.

	% *Standard Moisture Content*	% *Standard Regain*
Cotton	7.83	8.5
Silk	9.91	11.0
Flax and hemp	10.71	12.0
Jute	12.09	13.75
Wool and waste	13.79	16.0
Wool (tops combed with oil)	15.97	19.0
Wool (tops combed without oil)	15.43	18.25
Worsted yarns	15.43	18.25
Carded woolen yarns	14.53	17.0
Wool noils (ordinary)	12.28	14.0
Wool noils (scoured and carbonized)	13.79	16.0
*Viscose and cuprammonium rayons	9.91	11.0
*Cellulose acetate rayon	5.66	6.0

In the original setting up of these standards, it was assumed that when 100 parts of the fiber in the oven-dry state were exposed to the "usual condition of the atmosphere," they would take up or "regain" moisture to the extent shown by the percentage moisture contents and the regains in the above table.

When the moisture contents and the regains of the materials accord with the Standard shown in the Table, they are regarded as "100 per cent in correct condition."

*According to the B.I.S.F.A. Regulations, other standards obtain in certain circumstances.

Sodium Hydrosulfite (Sodium Dithionite)

J. Soc. Dyers & Col., 56-442, *Oct.*, 1940.—In a recent report drawn up by a committee appointed by the Union Internationale de Chemie for the reform of inorganic nomenclature, it is recommended that the name of the parent acid, from which the widely used sodium hydrosulfite is derived, viz. $H_2S_2O_4$, should be dithionous acid and its salts should be termed dithionites. It is pointed out that the name "hydrosulfurous acid" for the compound $H_2S_2O_4$ was proposed by its discoverer, Schützenberger, because of the erroneous assumption that its salts had the general formula RHS_2O_4. The name "hyposulfurous acid," proposed by Bernthsen and others for the compound $H_2S_2O_4$, is also considered to be unsatisfactory, quite apart from the fact that its employment might give rise to confusion so long as the use of the name "hydrosulfite" for "thiosulfate" has not been entirely abandoned.

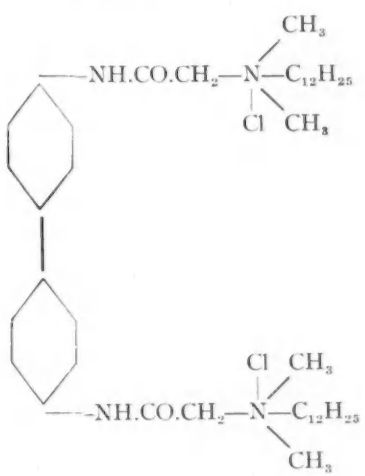
Fats and Waxes—

(Continued from page 400)

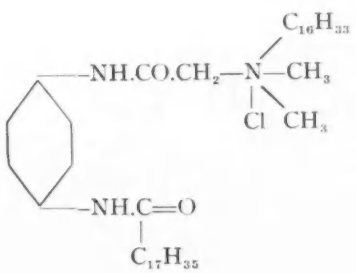
auxiliaries also contain long chain aliphatic radicals such as the dodecyl and stearyl radicals derived from natural fats and waxes.

These auxiliaries may be very complex and it is not possible to describe but more than a few here. Two such auxiliaries are shown below:

(I)



(II)

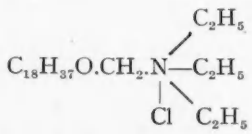


Of these compounds (I) is derived from benzidine and (II) from para-phenylene diamine. In using them, the dyed cotton or viscose rayon is treated in a hot solution of the auxiliary, then mangled, and dried; a baking at a high temperature is not necessary.

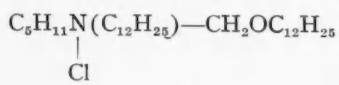
In making auxiliaries of this type from aromatic substances one of the chief difficulties is that of producing substances which are colorless and which do not discolor on exposure to light after their application to the dyed textile material.

It may be recalled that in producing water repellent effects, auxiliaries have been described of the type of cetyl-oxy-methyl pyridinium chloride. These same substances can be used to increase the water-fastness of direct dyeings but they are not entirely satisfactory for this purpose since their aqueous solutions are not stable when heated. It is for this purpose that the padding liquors containing them are used at not more than 20 to 30° C. But it has lately been discovered that by slightly modifying the composition of these auxiliaries the necessary stability can be obtained. Instead of having the nitrogen quaternary atom in pyridine nucleus it is better to have it present united to the necessary number of alkyl groups or in a piperidine nucleus. Such auxiliaries are also somewhat easier and cheaper to produce.

Among the compounds which can be used in this direction are triethyl-octadecyloxymethyl-ammonium chloride (this is obtained by uniting octadecyl-chloromethylether and triethylamine)

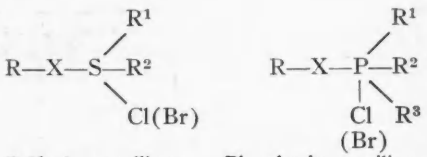


and dodecyl-dodecoxy-methyl-piperdinium chloride



Thus cotton dyed with a loose direct cotton dye such as Congo Red can be treated for ½ hour at 70 to 100° C. with a 0.2 per cent solution of the triethyl-octadecyloxymethyl-ammonium chloride auxiliary, then rinsed, and dried, whereby the dyeing acquires good fastness to water.

Yet another type of auxiliary for this same purpose of making direct dyeings faster to water is to be found in certain ternary sulfonium and quaternary phosphonium compounds which contain a high molecular weight fatty radical. It is suspected that these have not yet found commercial application on account of their higher cost, but nevertheless they point the way to further developments. These auxiliaries have the following typical chemical structures in which it is evident that the sulfur atom is tetravalent and the phosphorus atom is pentavalent. These compounds are analogous to the quaternary ammonium auxiliaries in which the nitrogen atom is replaced by sulfur or phosphorus atoms.



Sulfonium auxiliary Phosphonium auxiliary

in which R represents a high molecular fatty radical while R^1, R^2, and R^3 represent alkyl radicals of comparatively low molecular weight such as methyl and ethyl. X is a linking group of atoms such as —NH—CH_2— and —CH_2—.

These auxiliaries are applied to the dyed cellulosic material by simple treatment in a warm or cold dilute solution, followed by rinsing and drying. Typical compounds are dimethyl-hexadecyl-sulfonium methoxsulfate, benzyl-ethyl-dodecyl sulfonium chloride, hexadecyl-phosphonium bromide, and triethyl-dodecyl phosphonium bromide.

Sufficient has now been described above to indicate the great importance of the various fatty alcohols and acids derived from natural fats and waxes in the manufacture of auxiliaries for making textile materials of all kinds soft, water repellent, and faster to water and perspiration when dyed with direct cotton colors. This development in the uses of such natural products has largely come about as the result of the commercial hydrogenation of fatty substances. A new line of development will commence as soon as there can be produced other fatty derivatives instead of alcohols, but so far this step seems to be much more difficult.

CORRECTION

IN the article entitled "Photochemical Reactions in Silk" by Henry A. Rutherford and Milton Harris, in the next to the last line in the first column on page 346, it should read temperature of 70° F. and not 70° C.

• CLASSIFIED • ADVERTISEMENTS

POSITION WANTED: Yarn Dyer and Textile Chemist, draft deferred, wide experience in direct, vat, naphthol and acid colors on rayon, cotton and wool, seeks position. Write Box No. 334, American Dyestuff Reporter, 440 Fourth Ave., New York, N. Y.

DYER WANTED: Experienced on laces or crepes. Technical training essential. Excellent opportunity for young man. Paterson. Write Box No. 335, American Dyestuff Reporter, 440 Fourth Ave., New York, N. Y.

WANTED: BOSS DYER New York City. Rayon and Cotton Knit Goods. State age, experience, and salary expected. Write Box No. 336, American Dyestuff Reporter, 440 Fourth Ave., New York, N. Y.